Fieldbus

NI-FBUS™ Configurator
User Manual

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This manual gives an overview of fieldbus, describes the NI-FBUS Configurator, and explains how to use the NI-FBUS Configurator. The NI-FBUS Configurator is intended for use with Microsoft Windows NT.

This manual assumes that you are already familiar with Windows NT.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Fieldbus Overview,* introduces fieldbus and the parts of a fieldbus network.

- Chapter 2, *Configuring a Fieldbus System*, contains brief instructions on how to configure a typical fieldbus system.

- Chapter 3, *NI-FBUS Configurator Overview,* introduces the NI-FBUS Configurator, lists some of its main features, and describes the main windows of the application.

- Chapter 4, *Using the NI-FBUS Configurator,* describes how to use the NI-FBUS Configurator to configure your fieldbus system.

- Appendix A, *Error Messages and Warnings,* lists error messages you might receive while using the NI-FBUS Configurator and describes the error messages.

- Appendix B, *Troubleshooting and Common Questions*, describes how to troubleshoot problems and answers some common questions.

- Appendix C, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.

- The *Glossary* contains an alphabetical list and description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

- The *Index* contains an alphabetical list of key terms and topics in this manual, including the page where you can find each one.

Conventions Used in This Manual

This manual uses the following conventions:

<>	Angle brackets enclose the name of a key on the keyboard—for example, <Enter>.
»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options» Substitute Fonts** directs you to pull down the **File** menu, select the **Page Setup** item, select **Options**, and finally select the **Substitute Fonts** options from the last dialog box.
bold	Bold text denotes parameters, menus, menu items, dialog box buttons or options, and error messages.
bold italic	Bold italic text denotes a note.
`bold monospace`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard. This font is also used for the proper names of disk drives, paths, directories, programs, device names, filenames, and extensions, and for statements and comments taken from programs.

Related Documentation

The following documents contain information that you may find helpful as you read this manual:

- FOUNDATION Fieldbus Specification: *System Architecture*
- FOUNDATION Fieldbus Specification: *Function Block Application Process, Parts 1 and 2*

Customer Communication

National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in Appendix C, *Customer Communication*, at the end of this manual.

Fieldbus Overview

This chapter introduces fieldbus and the parts of a fieldbus network.

This chapter contains fieldbus information that can help you use the NI-FBUS Configurator and solve problems with the configuration of your fieldbus system. Refer to the *Glossary* for more explanation of fieldbus terms and concepts. If you already have a basic knowledge of fieldbus concepts, or if you want to start using the NI-FBUS Configurator immediately, skip to Chapter 3, *NI-FBUS Configurator Overview*.

Introduction to Fieldbus

The term *fieldbus* refers to an all-digital, two-way communication system that connects control systems to instrumentation.

The *Fieldbus Foundation* is an organization that developed a fieldbus network based on the work and principles of the ISA and IEC. The goal of the Fieldbus Foundation is to help create products that use a robust industrial network based on existing standards and other proven technologies and to standardize using those sources.

FOUNDATION Fieldbus, which is the communications network the Fieldbus Foundation created, is a protocol designed for robust, distributed control in process control environments. Devices connected by FOUNDATION Fieldbus control a process by exchanging data.

Parts of a Fieldbus Network

There are six conceptual parts to a fieldbus network: links, devices, blocks and parameters, linkages, loops, and schedules.

Links

A FOUNDATION Fieldbus network is made up of devices connected by a serial bus. This serial bus is called a *link*. Links can be separated by special devices called *bridges*. Figure 1-1 shows a link in a fieldbus network.
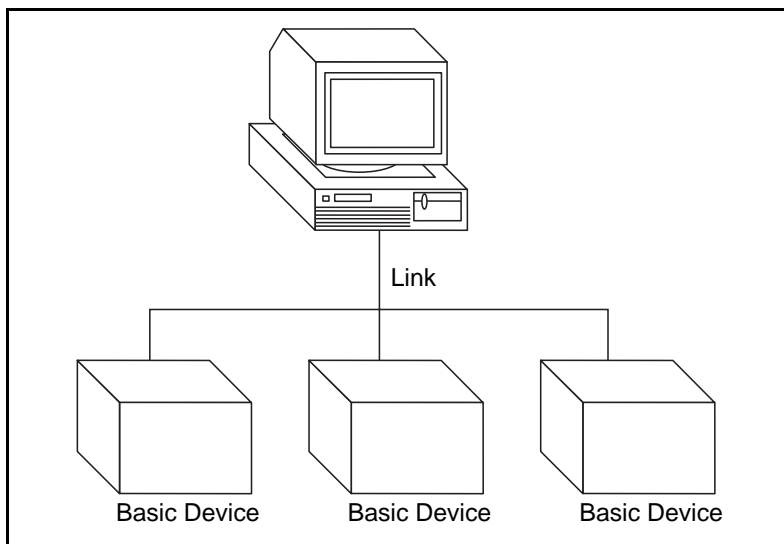
Figure 1-1. Fieldbus Network Link

Devices

There are three types of devices on a fieldbus network: the *link master*, *basic devices*, and *bridges*.

- *Link master*—A link master device controls the communications traffic on a link. A link master prevents multiple devices from communicating data at the same time. A link master can be a Distributed Control System (DCS) or any other device, such as a valve or a pressure transducer. There can be more than one link master per link, but only one link master can be the *Link Active Scheduler (LAS)* at any given time.

- *Basic device*—A basic device cannot become the LAS.

- *Bridge*—A bridge connects two or more links.

Figure 1-2 shows these three types of devices.
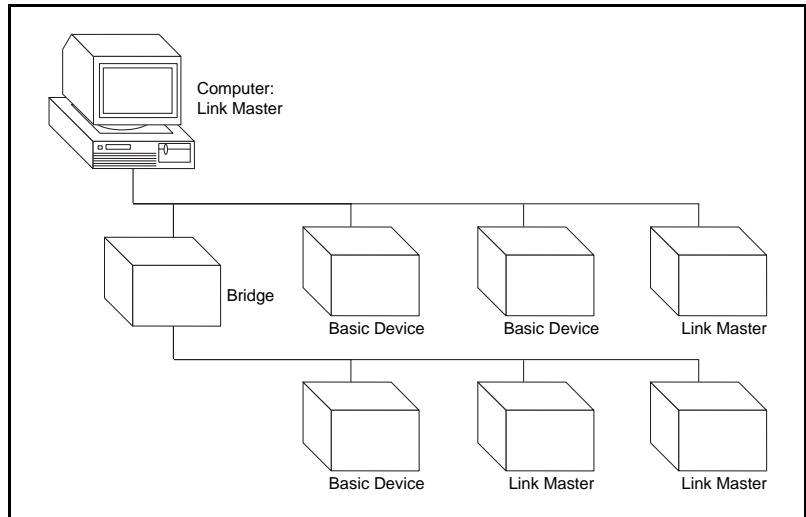
Figure 1-2. Fieldbus Network Devices

Identifying Devices

Devices are uniquely identified on the fieldbus network by character string name, or tag. The *device tag* is a configurable attribute of the device that usually describes the type of the device. Device tags are unique to each device on a fieldbus network.

Another unique identifier of a device is the *device ID*, which includes a serial number unique to the device. The device ID is assigned by the device manufacturer; you cannot configure it.

Blocks and Parameters

Usually, a device has a set of functions it can perform. These functions are represented as function blocks within the device. Function blocks contain algorithms and algorithm-controlling parameters. The FOUNDATION Fieldbus specification *Function Block Application Process* defines 10 standard blocks and algorithms as follows:

- Analog Input (AI)

- Analog Output (AO)

- Discrete Input (DI)

- Discrete Output (DO)

- Proportional Integral Derivative (PID)

- Proportional Derivative (PD)

- Bias Gain (BG)

- Ratio Control (RC)

- Control Selector (CS)

- Manual Loader (ML)

You can change or set the action of a block by changing the settings of its parameters. Figure 1-3 shows an example of a function block and its input and output parameters.
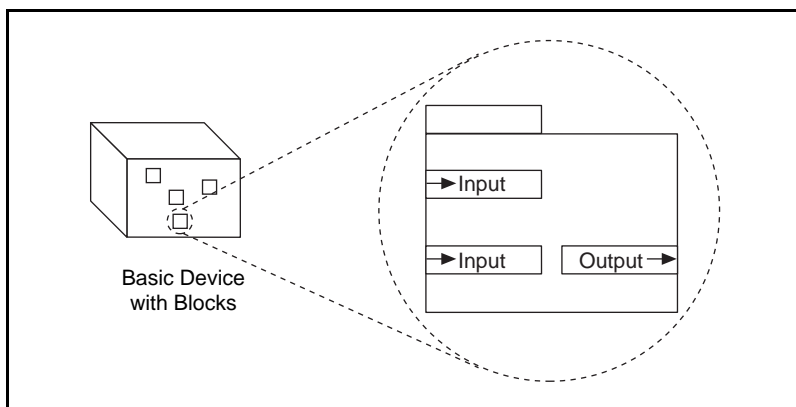
Figure 1-3. Function Block Parameters

Function block parameters are classified as follows:

- *Input* parameters receive data from another block.

- *Output* parameters send data to another block.

- *Contained* parameters do not receive or send data; they are contained within the block.

Function block parameters are also classified as alarm, trend, or tuning parameters. These classifications are independent of the input, output, and contained classifications. For example, an input parameter can also be an alarm, trend, or tuning parameter.

Device Description Files

The device vendor supplies Device Description (DD) files, which describe the function and transducer blocks contained in a device. A DD file includes symbolic information (such as names and help strings) and functional information (such as menus and methods that you can use with the device). You can use DDs with the NI-FBUS Configurator to configure a device.

Identifying Blocks

Blocks are uniquely identified on the fieldbus network by a character string name, or tag, similar to the device tag. The *block tag* is an attribute of a block that usually describes the purpose and location of the block. You can change the block tag, but block tags must be unique to each block on a fieldbus network.

Linkages

The function blocks configured to control a process are linked, or connected by configuration objects inside the devices. These *linkages* allow you to send data from one block to the other. A linkage is different from a link, in that a link is a physical wire pair that connects devices on a fieldbus network, and a linkage is a logical connection that connects two function blocks.

A block parameter that is written to the bus is referred to as a *published parameter*. A block parameter that is receiving data is referred to as a *subscribed parameter*. Figure 1-4 shows an example of a linkage between blocks. In this example, the output parameter in block A is the published parameter and the input parameter in block B is the subscribed parameter. The blocks can be in the same device or in different devices.
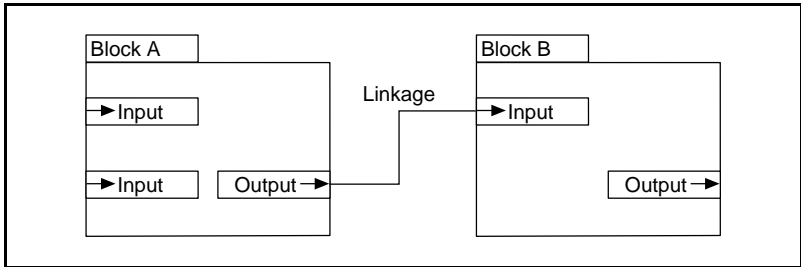
Figure 1-4. Linkage Between Function Blocks

Loops

A *loop* or control loop is a group of function blocks connected by linkages executing at a configured rate. Each block executes at the configured rate and data moves across the linkages between the blocks at the configured rate. Figure 1-5 shows an example of a control loop.
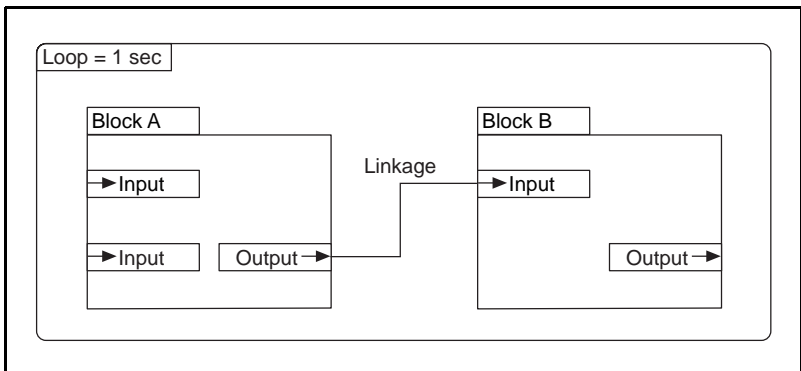
Figure 1-5. Control Loop

Multiple Loops

It is possible to have multiple loops running at different rates on a link. Figure 1-6 shows an example of multiple loops.
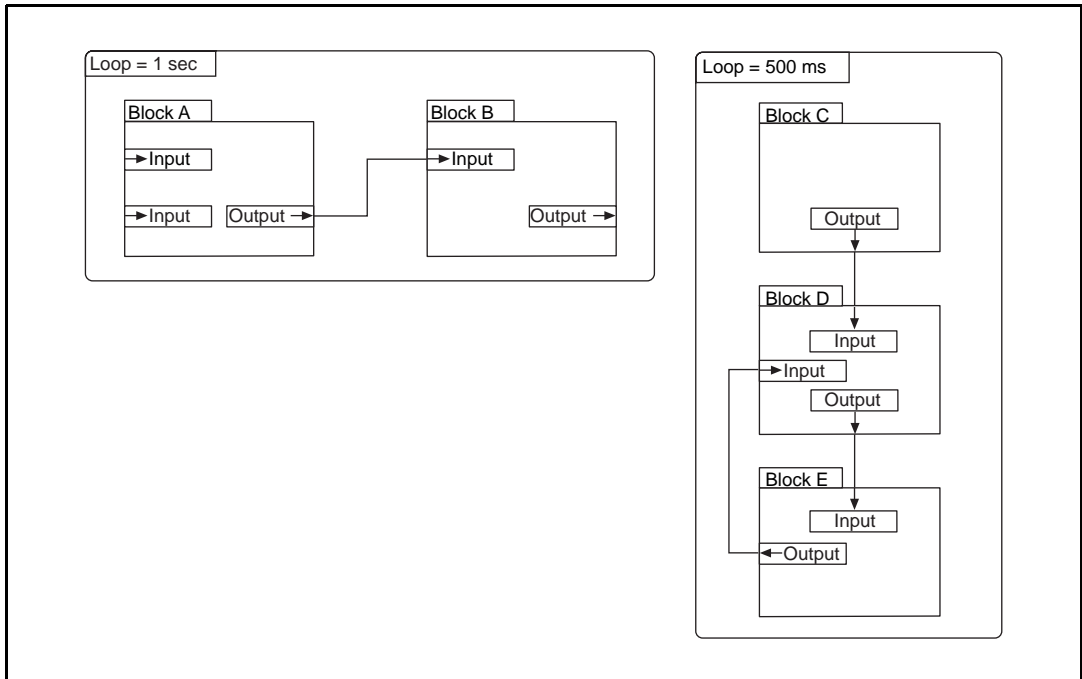
Figure 1-6. Multiple Loops Running At Different Rates

Even if loops are running at different rates, they can send each other data through linkages. Figure 1-7 shows an example of a linkage between two loops. All loops on a link run within one macrocycle. A *macrocycle* is the least common multiple of all the loop times on a given link. For example, the macrocycle in Figure 1-7 is 1 s.
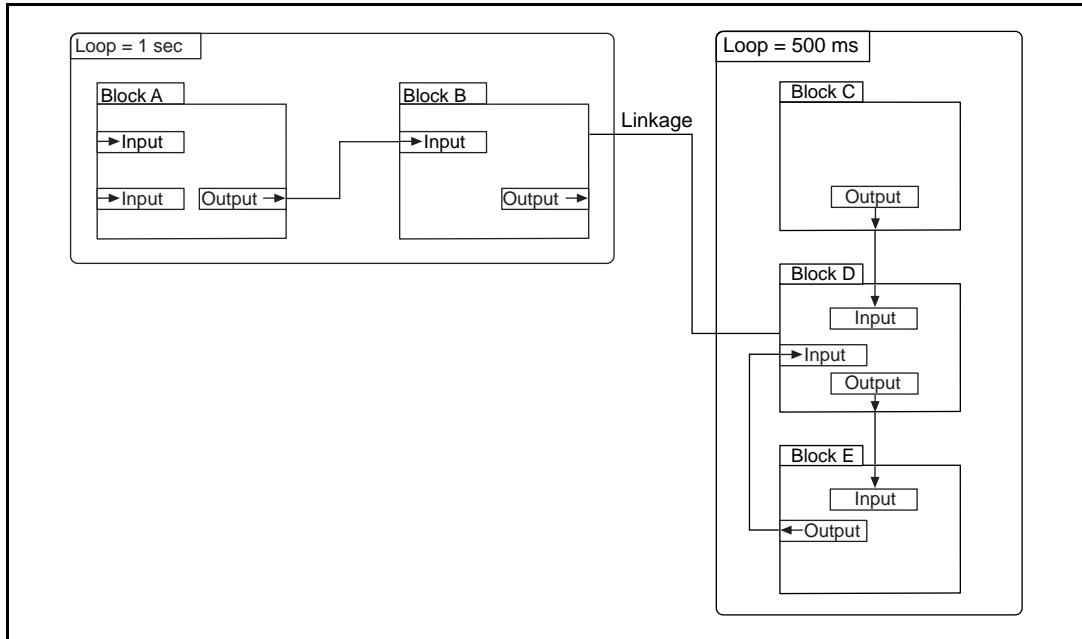
Figure 1-7. Linkage Between Two Loops

Schedules

A schedule of data traffic allows communication to be *deterministic*, meaning that data is transferred between a given set of devices at the same time during each loop.

The schedule can be divided into two parts: a function block schedule that determines when a block executes, and a publishing schedule that determines when data parameters are published over the fieldbus. The function block schedule is downloaded to the device that contains the function blocks, and the publishing schedule is usually downloaded to a device or devices that have link master capability. The link master running the publishing schedule and thus controlling the process is the LAS.

Downloading the schedule to multiple devices with link master capability ensures that the process is controlled, even if the LAS fails. If the LAS fails, another device with link master capability takes over the bus and runs the schedule. Figure 1-8 shows the relationship of the two schedules to the device, link, link master, and LAS.
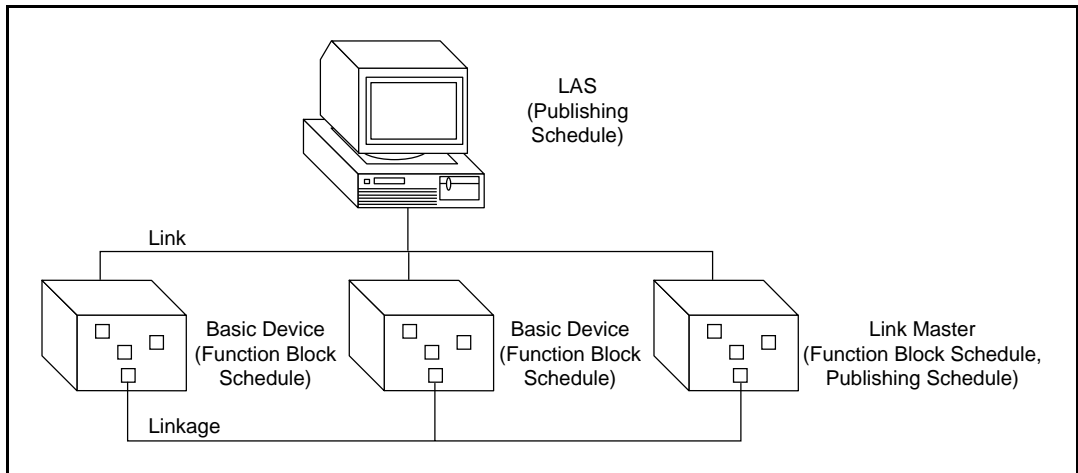
Figure 1-8. Publishing and Function Block Schedules Relationships

Configuring a Fieldbus System

This chapter contains brief instructions on how to configure a typical fieldbus system.

Refer to Chapter 1, *Fieldbus Overview*, or the *Glossary* for an explanation of fieldbus terms or concepts. Refer to Chapter 3, *NI-FBUS Configurator Overview,* for information about a specific control or window in the NI-FBUS Configurator.

☞ **Note:** *Before you use the NI-FBUS Configurator, you must install and configure your software and any fieldbus interfaces, as instructed in your getting started manual.*

Following is an example of what you typically configure in a fieldbus system, using the NI-FBUS Configurator:

1. Connect the devices in a segment.

   You can connect devices in one of two ways: online or offline. In the online mode, you connect the devices to the fieldbus segment and start the NI-FBUS Configurator.

   In the offline mode, the devices are not connected to the fieldbus.

   For instructions on how to connect devices, refer to the *Configuring Online* section in Chapter 4, *Using the NI-FBUS Configurator*.

2. Import the Device Descriptions (DDs) of the connected devices to the computer that runs the NI-FBUS Configurator.

   For instructions on how to import DDs, refer to the *Starting the NI-FBUS Configurator* section in Chapter 4, *Using the NI-FBUS Configurator*.

3. Set addresses and tags.

   Each device has a physical device tag and a fieldbus network address. You must assign a unique tag to each device. Each address must be unique within a fieldbus segment.

   Each device has function blocks that perform control functions, such as AI, AO, DI, DO, PID, and so on. Devices also have transducer blocks that perform I/O with sensors and actuators. You must assign a unique tag to function and transducer blocks.

For instructions on how to set addresses and tags, refer to the *Setting Device or Block Tags* and *Setting Device Addresses* sections in Chapter 4, *Using the NI-FBUS Configurator*.

4. Formulate a control strategy.

    To define your control strategy, identify the function blocks and connect the relevant function blocks. For example, if you are configuring a cascaded PID control, you must identify the primary and secondary PIDs and their inputs and outputs.

    You must also configure loop times or cycle times. For example, you can configure the primary loop in the cascade to execute at a certain rate, and configure the secondary loop to execute at a different rate.

    For instructions on how to formulate a control strategy, refer to the *Formulating a Control Strategy* section in Chapter 4, *Using the NI-FBUS Configurator*.

5. Schedule function blocks and communication.

    Fieldbus schedules the execution of function blocks and the communication between the connected function blocks. The two schedules are synchronized to prevent oversampling.

    For instructions on how to edit the schedule, refer to the *Viewing and Editing a Schedule* section in Chapter 4, *Using the NI-FBUS Configurator*.

6. Configure alarms.

    Using the NI-FBUS Configurator, you can configure fieldbus devices to generate alarms. Thus, you do not need an HMI to generate alarms. To configure alarms, identify the function blocks that generate alarms and the hosts that receive the alarms. You must also configure the alarm limits and priorities.

    For instructions on how to configure alarms, refer to the *Configuring Alarms* section in Chapter 4, *Using the NI-FBUS Configurator*.

7. Configure trends.

    Fieldbus devices collect trend samples (value, status, and time stamps) and broadcast them on the bus periodically. To configure trends, identify the function block (or transducer block) parameters that you want to trend, and configure the sampling rates and types for each of them. You must also identify which host or hosts receive the trend.

For instructions on how to configure trends, refer to the
Configuring Trends section in Chapter 4, *Using the
NI-FBUS Configurator*.

8. Set static parameters.

    For your control strategy to work, you must configure static
    parameters, such as scaling parameters like **XD_SCALE** in AI/AO
    blocks and **PV_SCALE** in PID blocks. For PID control, you must
    also configure engineering units, control and I/O options, fault state
    values for output blocks, and tuning parameters.

    For instructions on how to set parameters, refer to the *Viewing and
    Editing Function Block Parameters* section in Chapter 4, *Using the
    NI-FBUS Configurator*.

9. Configure input/output (I/O).

    Sensor and actuator I/O is typically modeled as a transducer block.
    Refer to your sensor or actuator documentation to determine
    whether you can configure I/O.

    For instructions on how to configure I/O, refer to the *Viewing and
    Editing Function Block Parameters* section in Chapter 4, *Using the
    NI-FBUS Configurator*.

10. Set network parameters.

    For communication and scheduling to function properly, you must
    configure the fieldbus communication-specific network
    parameters. An example of a network parameter is identifying the
    primary time master and the primary Link Active Scheduler (LAS)
    devices.

    For instructions on how to set network parameters, refer to the
    Setting Network Parameters section in Chapter 4, *Using the
    NI-FBUS Configurator*.

11. Download a configuration.

    Make sure that all the devices are connected to the bus, and
    download the configuration.

    For instructions on how to download a configuration, refer to the
    Downloading a Configuration section in Chapter 4, *Using the
    NI-FBUS Configurator*.

NI-FBUS Configurator Overview

This chapter introduces the NI-FBUS Configurator, lists some of its main features, and describes the main windows of the application.

Introduction to the NI-FBUS Configurator

You can use the NI-FBUS Configurator to configure a fieldbus network and keep track of your configuration changes. The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts described in Chapter 1, *Fieldbus Overview*.

Now that you are familiar with the basics of fieldbus communication, you are ready to use the NI-FBUS Configurator. To use the NI-FBUS Configurator immediately, continue to Chapter 4, *Using the NI-FBUS Configurator*.

NI-FBUS Configurator Features

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration

- Monitor a downloaded configuration
- Replace devices
- Log project download changes
- Save and print a configuration

NI-FBUS Configurator Windows

The NI-FBUS Configurator has three moveable, dockable windows within the Configurator Main window: the Project, Help, and Status windows.

Configurator Main Window

The Configurator Main window has menus at the top, and contains the windows described in the following sections. Figure 3-1 shows the Project, Help, and Status windows within the Configurator Main window.
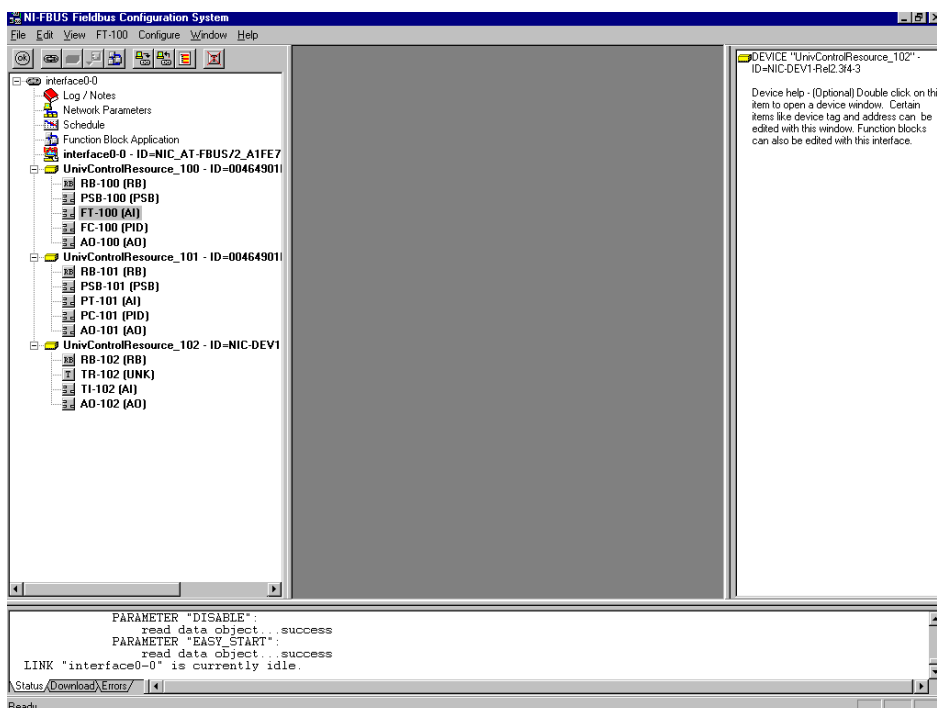
Figure 3-1. Configurator Main Window

Project Window

The Project window, which appears to the left of the Configurator Main window by default, displays the configurable objects of the link connected to the NI-FBUS Configurator. To configure each object, *double-click* on these icons in the Project window; doing so opens the correct interface to use to configure the object. Figure 3-2 shows the Project window.
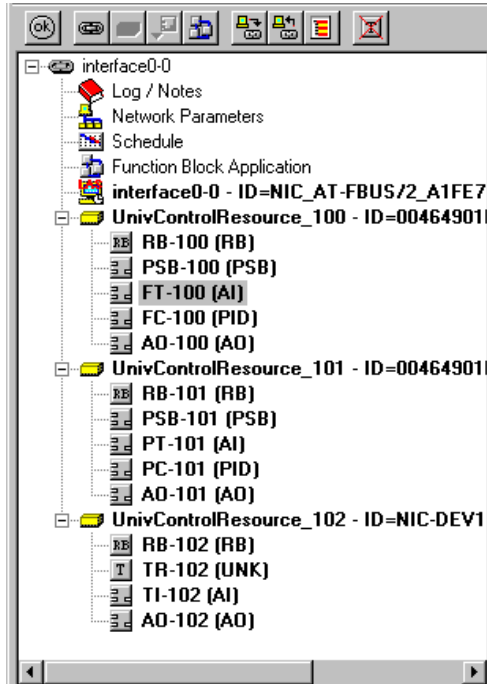
Figure 3-2. Project Window

Each object in the Project window has its own menu that appears on the
main taskbar when you select the object. You can also view the menu
by *right-clicking* on the object, as shown in Figure 3-3.
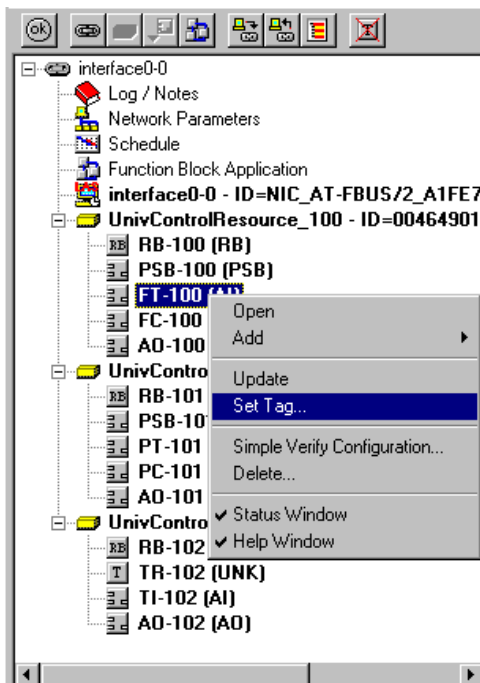
Figure 3-3. Project Window Pop-Up Menu

Conventions

The NI-FBUS Configurator uses the following standard user interface
conventions:

- Double-click with the left mouse button on an icon to open the
  correct interface to use to configure that object.

- Right-click on an icon to display a popup menu that lists actions
  you can perform on that object.

- When you single-click on an icon to select it, the popup menu
  appears in the main menu bar at the top of the Main window.

- To view the help information for an object, single-click on the icon to select it and keep the mouse cursor over the selected object. The appropriate help information appears in the Help window.

- You can drag and drop icons (block or device) from one window and into another.

Icons

Descriptions of the project icons that appear in the Project window follow:

- **Link**—This icon represents the fieldbus segment to which your PC is connected. Double-click on this item to open the Network Parameters window.

- **Log/Notes**—Double-click on this icon to see a summary of all the changes you have made to the project link.

- **Network Parameters**—Double-click on this icon to open the Network Parameters window and change the low-level configuration parameters for the link.

- **Schedule**—Double-click on this icon to see the schedule of function block executions and data transmissions for the entire link.

- **Function Block Application Editor**—Double-click on this icon to use the Function Block Application Editor to wire function blocks together into a function block application. You can add multiple function block applications to your project.

- **Device**—This icon represents a fieldbus device, followed by the device tag and its unique serial identifier. Double-click on this icon to open the Device window.

- **Host Device**—This icon represents the device (PC) that hosts the NI-FBUS Configurator. Double-click on this icon to open the Device window.

- **Function Block**—This icon represents a fieldbus function block, followed by the block tag and its type (in parentheses). Double-click on this icon to open the Block window.

State Icons

During the initial scan of the bus, state icons sometimes overlap the project icons. Descriptions of the state icons used in the Project window follow:

⏳

- Updating—This icon appears when the NI-FBUS Configurator is reading or writing to the object.

⚠

- Error—This icon appears when the NI-FBUS Configurator detects or encounters an error with the object.

🚫

- Invalid—This icon appears when the indicated object is not responding to the NI-FBUS Configurator scan.

Toolbar

The toolbar at the top of the Project window helps you perform basic operations on your project. Figure 3-4 shows the Project window toolbar.

Figure 3-4. Project Toolbar

Descriptions of the buttons on the Project toolbar follow:

- **Errors**—Click on this button to validate the project.
- **New Link**—Click on this button to add another link to the project.
- **New Device**—Click on this button to add another device to the project.
- **New Block**—Click on this button to add another block to the project.
- **New FBAP**—Click on this button to add another Function Block Application Editor window to the project.
- **Download Project**—Click on this button to open the Download Configuration dialog box.
- **Upload Project**—Click on this button to reread the configuration.
- **Verify and Diff**—Click on this button to upload your current configuration and compare it to the saved project.
- **Show/Hide Transducers**—Click on this button to hide the transducer blocks from the Project window.

Help Window

The Help window, which appears to the right of the Configurator Main window by default, displays help information for the object over which you place your cursor. The text is generated from the NI-FBUS Configurator and Device Description (DD) files. To hide the Help window, select **Window»Help Window**.

Figure 3-5 shows the Help window.
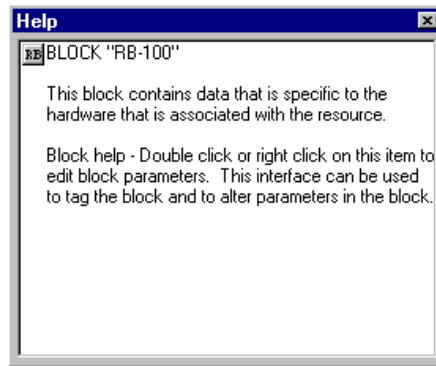
Figure 3-5. Help Window

Status Window

The Status window, which appears at the bottom of the Configurator Main window by default, displays the current status of the NI-FBUS Configurator. When you read, write, scan, or download data to the bus, the Status window shows the steps that the NI-FBUS Configurator takes to accomplish the task on the **Status** tab.

The Status window also contains **Download** and **Error** tabs. The **Download** tab is updated only when a configuration is downloaded to the bus. The **Errors** tab shows any errors in the current project. To hide the Help window, select **Window»Status Window**.

Status Tab

The **Status** tab shows live updates of what the NI-FBUS Configurator does on the fieldbus. For example, the **Status** tab shows when the NI-FBUS Configurator is reading, writing, and configuring. The **Status** tab automatically appears on top when you start the NI-FBUS Configurator.

Download Tab

The **Download** tab shows all the status information for the last configuration download of the bus. The NI-FBUS Configurator retains this information until the next download. The **Download** tab automatically appears on top when you begin to download your configuration. The status information on the **Download** tab is also in the **Log/Notes** window.

Errors Tab

The **Errors** tab, shown in Figure 3-6, displays all recent I/O errors, project configuration errors, and warnings. To fix an error, double-click on the error to open the window containing the error. Some error messages give hints about how to solve the problem. For a list of errors, refer to Appendix A, *Error Messages and Warnings*.
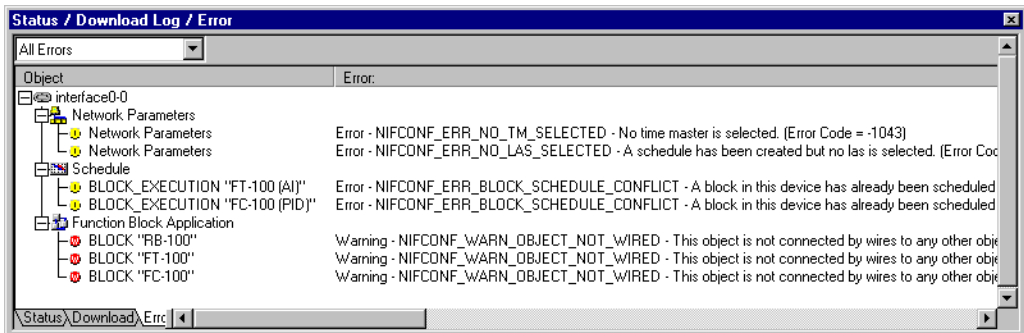
Figure 3-6. Errors Tab

The **Errors** tab has a drop-down list attached to the upper left corner of the window. Use this list to select the errors you want to see. The **All Errors** selection shows all I/O and project errors, and the **Project Errors** selection shows only project errors.

When you download your configuration, the NI-FBUS Configurator checks for errors in your project. If you have a project error, the NI-FBUS Configurator warns you and allows you to cancel the download.

The NI-FBUS Configurator automatically regenerates error information each time you change the project. However, you can force the NI-FBUS Configurator to revalidate the project by clicking on the **OK** toolbar button from any window.

Using the NI-FBUS Configurator

This chapter describes how to use the NI-FBUS Configurator to configure your fieldbus system.

Overview

This section contains a brief overview of the instructions included in this chapter. To configure your fieldbus system with the NI-FBUS Configurator, you typically complete the following steps:

1. Start the NI-FBUS Configurator.

2. Select a fieldbus interface that is connected to the bus you want to configure. The NI-FBUS Configurator automatically reads all devices and blocks from the network and assigns addresses to devices that appear at the startup default addresses.

3. (Optional) Set a device address. The NI-FBUS Configurator automatically assigns addresses to devices that appear at a default address.

4. (Optional) Change device and block tags. The NI-FBUS Configurator automatically renames and tags devices whose tags are not unique.

5. Add or edit function blocks to create a function block application.

6. Connect blocks. To configure linkages, drop function blocks on the screen and wire the proper outputs to inputs.

7. Define loops. The NI-FBUS Configurator contains *templates*, which are typical process control loops that are already wired. You can also create and save your own templates.

8. (Optional) Change block parameter values (for example, setpoints and alarm limits) to suit your configuration.

9. (Optional) Configure trends and alarms.

10. (Optional) Alter the schedule. You can alter the schedule after the NI-FBUS Configurator automatically generates a schedule based on the function block wiring diagram and loop execution times.

11. Download the configuration to the fieldbus network. The NI-FBUS Configurator downloads changes to your configuration only when you complete this step.

Starting the NI-FBUS Configurator

☞ **Note:** *Before you use the NI-FBUS Configurator, you must install and configure your software and any fieldbus interfaces, as instructed in your getting started manual.*

To start the NI-FBUS Configurator, complete the following steps:

1. Select **Start»Programs»NIFBUS»NI-FBUS Configurator**. The **Add Links** dialog box appears, as shown in Figure 4-1.
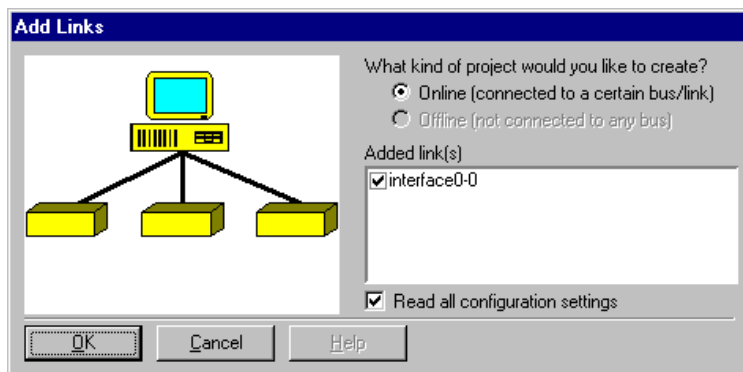
Figure 4-1. Add Links Dialog Box

2. Select the interface to which you want to connect from the **Added Link(s)** checklist.

3. To create a new project that is connected to the links you checked, click on the **OK** button. To open an existing project, click on the **Cancel** button.

Configuring Online

When you start the NI-FBUS Configurator, or when you create a new project, the **Add Links** dialog box appears, as shown in Figure 4-1.

To add new links at any other time, click on the **Link** button in the toolbar.

☞ **Note:** *You can edit saved configuration files without connecting to the fieldbus. To open a saved configuration, click on the* **Cancel** *button to close the* **Add Links** *dialog box that appears. Select* **File»Open** *and browse to your saved configuration files, which have a* .fcp *extension.*

To connect to a specific fieldbus interface, complete the following steps:

1. In the **Add Links** dialog box that appears, select the interface that you want to connect to from the **Added Link(s)** checklist.

2. Click on the **OK** button to create a new project that is connected to the links you checked.

   The NI-FBUS Configurator scans the fieldbus network and checks addresses and object tags. If a device is missing either an address or a tag, the NI-FBUS Configurator assigns one. If the NI-FBUS Configurator detects duplicate tags, it renames the device or block, appending the original device or block tag with a numeric identifier.

After you complete the preceding steps, the NI-FBUS Configurator creates a new project so you can develop your configuration. The Project window appears, displaying all the fieldbus objects on the link or links to which your PC is connected. Figure 4-2 shows the Project window with an example list of fieldbus objects. For more information

about the parts of the Project window, refer to the *Project Window* section of Chapter 3, *NI-FBUS Configurator Overview*.
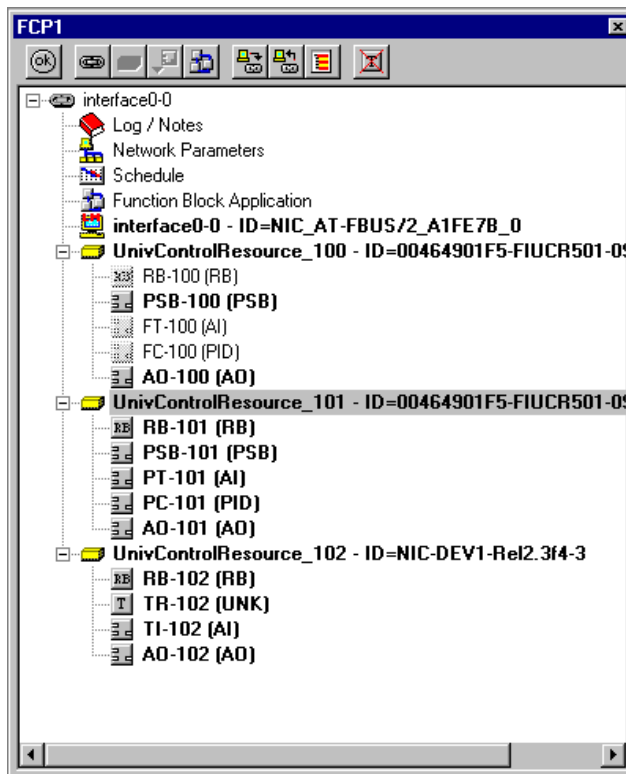
Figure 4-2. Fieldbus Object List in the Project Window

Importing Device Description Files

If you want to use Device Description (DD) files with the NI-FBUS Configurator, you must import the DD files. To do so, complete the following steps:

1. Select **Start»Programs»NI-FBUS»Interface Config** to run the Interface Configuration utility.

2. Click on the **DD Info** button. The **DD Info** dialog box appears, as shown in Figure 4-3.
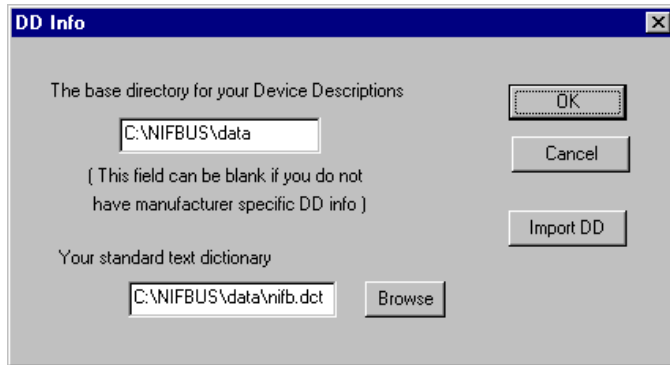
Figure 4-3. DD Info Dialog Box

3. Type the base directory for your DD files in the first field.

4. If necessary, click on the **Browse** button to select your standard text dictionary.

5. Click on the **Import DD** button. The **Import DD** dialog box appears, as shown in Figure 4-4.
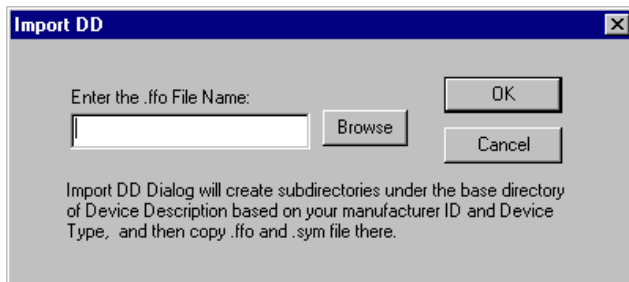
Figure 4-4. Import DD Dialog Box

6. Click on the **Browse** button and browse to the `.ffo` DD file path and click on the **OK** button.

For more information about DD files, refer to the *Device Description Files* section in Chapter 1, *Fieldbus Overview*.

Setting Device or Block Tags

Setting a device or block tag may affect how other host machines on an (online) operating network access the device. Take care when you set the tags; make sure the operating control system is not using the device or function block. Specifically, when you set the device tag, the device loses all linkage and communication configuration information and loses control of the process.

To set a tag, complete the following steps:

1. In the Project window, select the device or block whose tag you want to change.

2. Right-click on the device or block, or select **Object Name** from the main menu bar.

3. Select **Set Tag** from the pop-up menu that appears.

4. To set the tag for a block, check the **Set to OOS Mode** checkbox in the **Set Tag** dialog box, as shown in Figure 4-5.
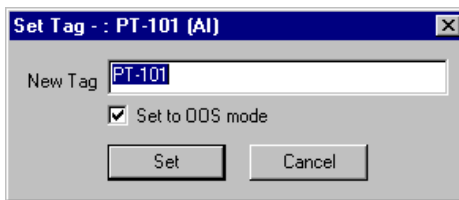
Figure 4-5. Setting an Object to OOS Mode

5. In the **New Tag** text box, type the tag you want to assign to the object.

6. Click on the **Set** button. The NI-FBUS Configurator sets the block or device to OOS mode before setting the new tag. If the device or block does not go to OOS mode, the NI-FBUS Configurator notifies you and you must determine whether to continue to set the tag.

7. After you successfully set the tag, you can use the Block window to change the block from OOS mode to a desired mode, as shown in Figure 4-6.
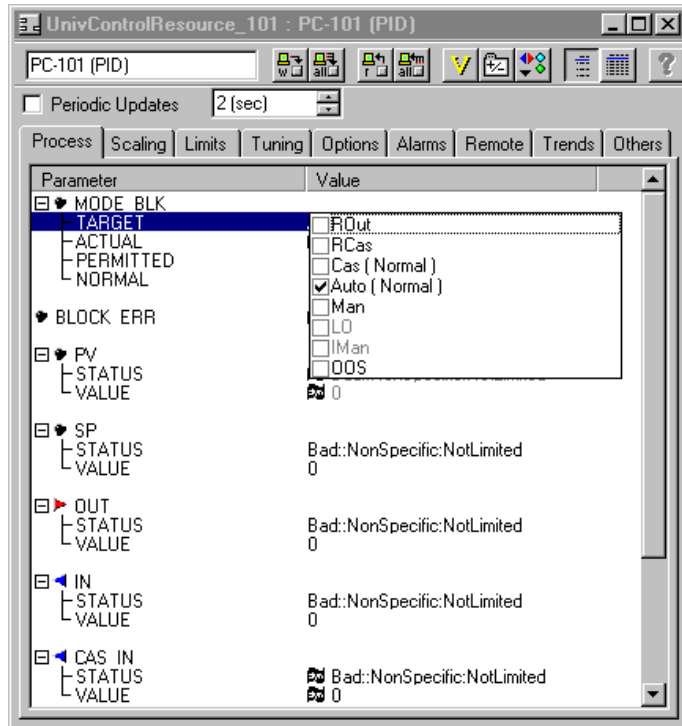
Figure 4-6. Setting an Object to the Desired Mode

Setting Device Addresses

When you set the address, make sure the operating control system is not using the device. When you set the address, the device deletes all communication information.

Complete the following steps to set the device address:

1. In the Project window, select the device whose address you want to set.

2. Right-click on the device or select **Devices** from the main menu bar.

3. Select **Set Address** from the pop-up menu that appears. The **Set Address** dialog box appears.

4. In the **New Address** field, select the desired address from the drop-down list, as shown in Figure 4-7.
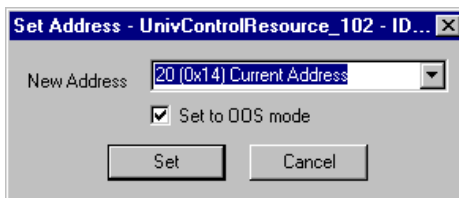
Figure 4-7. Setting a Device Address

5. Check the **Set to OOS Mode** checkbox in the **Set Address** dialog box, as shown in Figure 4-7. Doing so sets the block to OOS mode, which prevents the device from operating in its current control system.

6. Click on the **Set** button.

   The NI-FBUS Configurator sets the device resource block to out of service (OOS) mode before setting the new address. If the device does not go to OOS mode, the NI-FBUS Configurator notifies you and you must determine whether to continue to set the address.

7. After you successfully set the address, you can set the resource block to a desired mode (typically **NORMAL_MODE**).

Resetting a Device to Factory Defaults

You can clear a device so that it is reset to a state appropriate for shipping. To do so, right-click on the device name in the Project window and select **Set to Factory Defaults** from the popup menu that appears.

The NI-FBUS Configurator clears the device and function block tags, along with the device address. In addition, it clears all communication information in the device.

Formulating a Control Strategy

The Function Block Application Editor, shown in Figure 4-8, is the graphical interface you use to create your fieldbus control strategy in the NI-FBUS Configurator.
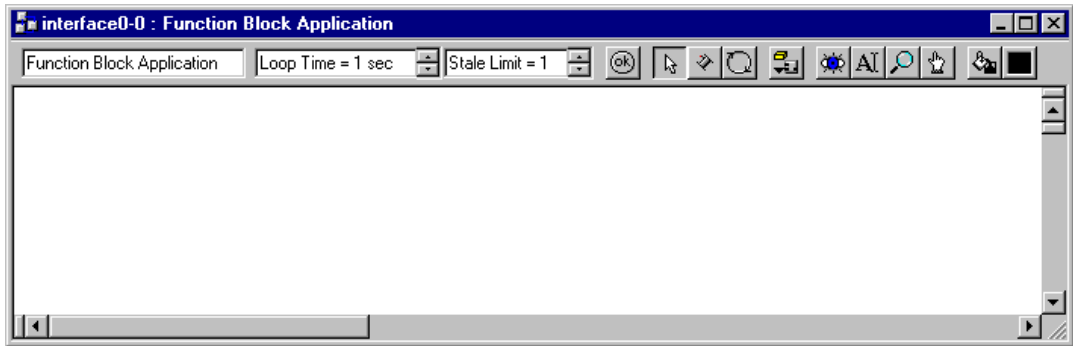
Figure 4-8. Function Block Application Editor

You can open the Function Block Application Editor by double-clicking on its icon in the Project window.

The toolbar, shown in Figure 4-9, at the top of the Function Block Application Editor displays the various tools used for function blocks.
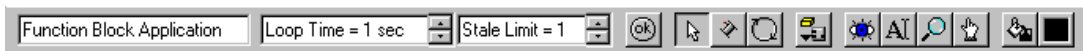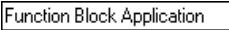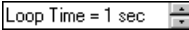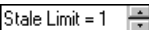
Figure 4-9. Function Block Application Editor Toolbar

Descriptions of the items on this toolbar follow:

- **FBAP Name**—This field shows the name of the function block application.

- **Loop Execution Time**—This field shows the default execution rate of the process loop.

- **Stale Limit**—This field shows the number of consecutive duplicate values that a function block accepts before it labels the input data as stale (old data).

- **Errors**—Click on this button to perform error checking, regenerate the schedule of the application, and remove bad wires.

- **Pointer**—Click on this button to drag and highlight objects on the screen.

- **Wiring**—Click on this button to make connections between valid inputs and outputs. When you try to make a connection, the NI-FBUS Configurator checks the data type of the input and output you are trying to connect, and highlights the connection if it is valid.

- **Loop**—Click on this button to isolate certain function blocks from the default execution time. The default execution time on the toolbar is the execution rate for all blocks on the Function Block Application Editor. However, you can define multiple loops that run at rates other than the default execution time. The **Loop** tool helps you to assign a special execution rate to a group of function blocks. For more information about running loops at different rates, refer to the *Defining Multiple Loops* section of this chapter.

- **Block**—Click on this button to show the block menu.

- **Monitor FBAP**—Click on this button to enable graphical monitoring of the process.

- **Text**—Click on this button to type additional information about the application to the screen and change text in fields.

- **Zoom**—Click on this button to zoom in and out. To zoom in, drag a rectangle around the area you want to enlarge. To zoom out, right-click on the background of the Function Block Application Editor window.

- **Execution Order**—Click on this button to choose the order of execution for blocks. The NI-FBUS Configurator automatically decides the order of the blocks, but you can change the default order by using the **Execution Order** tool to click on the blocks in the order you want them to execute.

- **Fill**—Click on this button to fill objects on the screen with a color.

- **Fill Color**—Click on this button to select a color to be used with the **Fill** tool.

Note: *To switch between the major tools you are using, press <Tab>. To switch between the pointer and the wiring tool, press the spacebar.*

Function Blocks

As stated in the *Blocks and Parameters* section of Chapter 1, *Fieldbus Overview*, function blocks contain an algorithm and several parameters to control a process. The input and output parameters of this function block are displayed on the block, as in Figure 4-10.
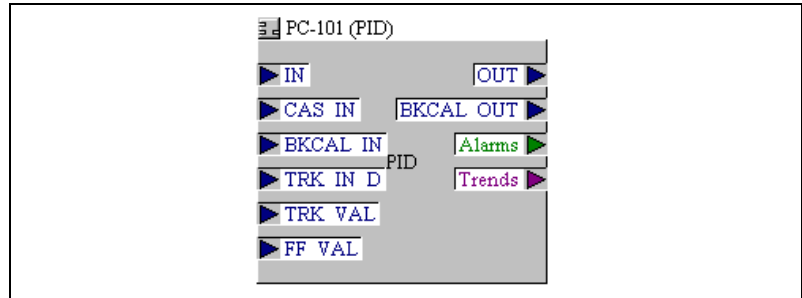
Figure 4-10. Input and Output Parameters on a Function Block

The pointers on the outside of the parameters show the data flow direction of that parameter. By default, the block tag is at the top, the inputs are on the left, and the outputs are on the right.

You can resize the block and move the tag relative to the block.

To change the tag, double-click on the block tag to open the edit box, or right-click and select **Set Tag** from the drop-down list.

Adding Function Blocks

To add function blocks, complete the following steps:

1. To open the Function Block Application Editor, double-click on the Function Block Application Editor icon in the Project window.

2. Drag blocks from the Project window to the Function Block Application Editor until all the blocks you want to use are in the Function Block Application Editor. Figure 4-11 shows what a block looks like while you drag it from the Project window.
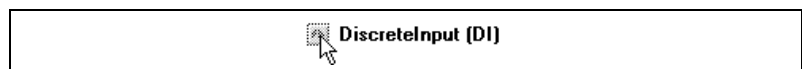
Figure 4-11. Dragged Block

3. If you want to change the names of the blocks, double-click on a tag or use the **Text** tool on the Function Block Application Editor toolbar.

You can also add function blocks as follows:

1. Right-click on the background of the Function Block Application Editor or click on the **Block** button.

2. Select the device from the menu that appears, and then select the block you want to place on the screen from the menu of function blocks.

☞ **Note:**   *You can use a function block on a fieldbus network only once. After you use a function block in a Function Block Application Editor window, the function block is grayed out on the menu and in the Project window.*

Figure 4-12 shows how the Function Block Application Editor looks with function blocks dragged onto it.
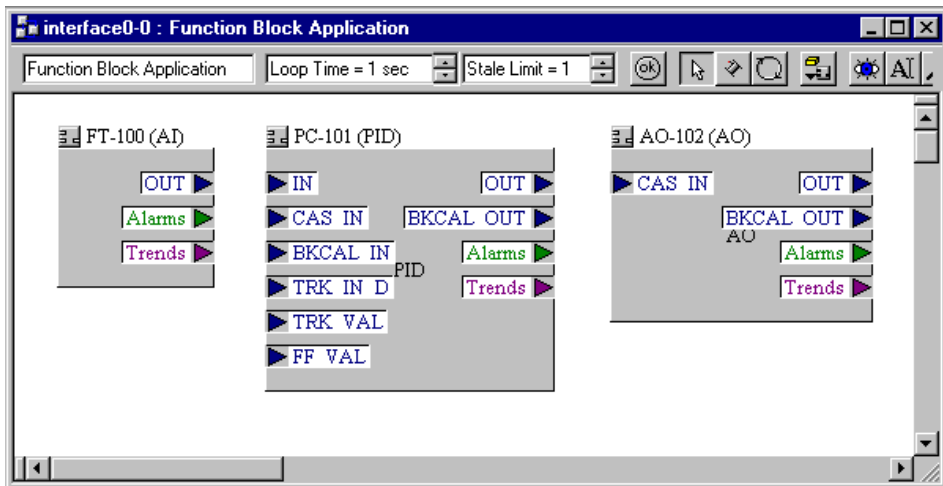
Figure 4-12. Added Function Blocks

Connecting Blocks

To send data from one block to another, you must connect the blocks. You can wire blocks manually or use a template.

Wiring Blocks Manually

To wire blocks manually, complete the following steps:

1. Click on the **Wiring** tool on the Function Block Application Editor toolbar.

2. Click on the input or output to which you want to connect.

3. Click on the background of the Function Block Application Editor window to guide the connection to the input or output to which you want to attach the wiring.

☞ **Note:** *To toggle the direction of the connection you are dragging, press the spacebar while wiring.*

4. Click on the input or output to which you want to wire.

When you click on the Wiring tool, the NI-FBUS Configurator performs type checking and highlights valid inputs and outputs when you move the cursor over them.

Figure 4-13 shows the **BKCAL OUT** output of the **AO** block being wired to the **BKCAL IN** input of the **PID** block.
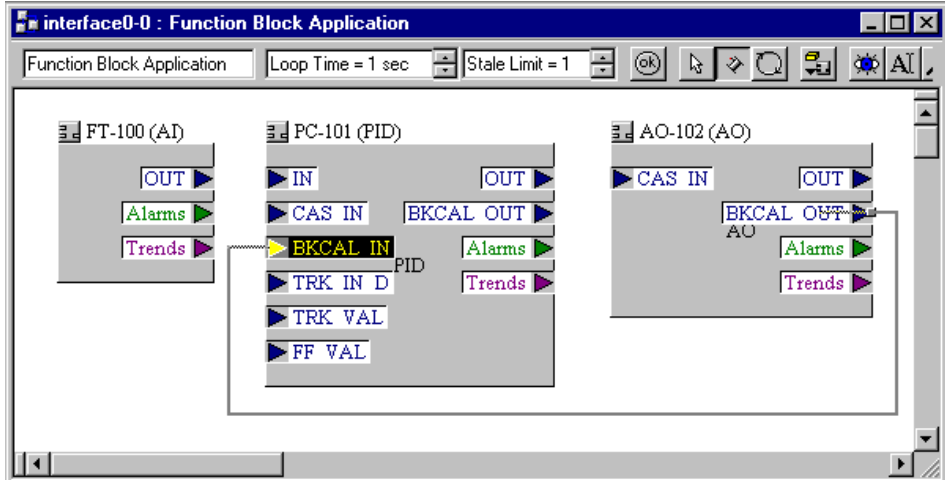
Figure 4-13. Wiring to a Block Input

You can also drag devices from the Project window into the Function Block Application Editor to configure alarms and trends, as described in the *Configuring Alarms* and *Configuring Trends* sections.

Using Pre-Wired Templates

Templates are pre-defined, pre-wired control loops that you can drag into the Function Block Application Editor to use as a model for your function block application. The NI-FBUS Configurator includes several types of templates. You can also save your own template as a file by selecting **File»Save Template**. The NI-FBUS Configurator saves all templates in the c:\Nifb\fcs\templates directory. If a template is in that directory, it automatically appears in the template menu.

To access templates, do one of the following:

*   Right-click on the background of the Function Block Application Editor and select **FBAP Templates**.

*   Select **File»Open Template**.

The NI-FBUS Configurator includes the following templates:

*   PID Feedback Control

*   Manual Control with PV Indication

*   PD Feedback Control

*   Track Feedforward Control

*   Cascade Control

*   Ratio Control

*   Override Control

Figure 4-14 shows an example of a template.
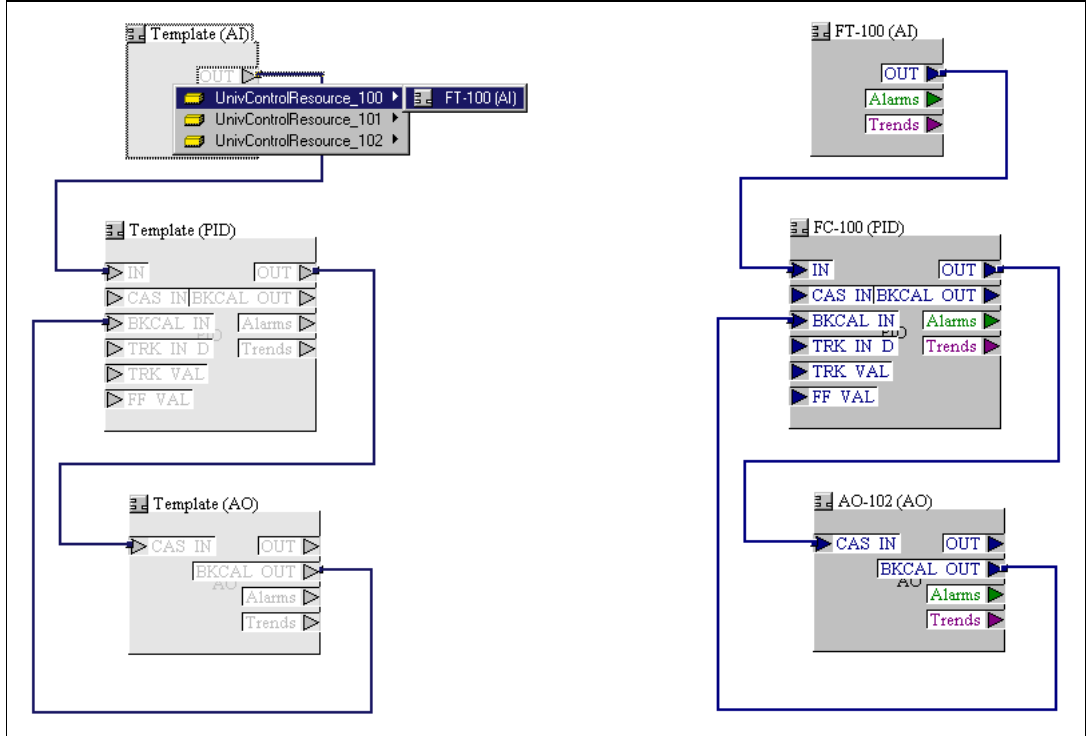
Figure 4-14. Template

If template blocks are grayed out, as shown on the left in Figure 4-14, you have not assigned a function block to the template block. To assign a function block to the template block, complete the following steps:

1. Double-click on the template block to view all the blocks that match this block type in your project. You can also right-click on the block and select **Replace** from the popup menu that appears.

2. Select the desired block from the list that appears.

Your application is not complete until you replace all the template blocks with function blocks from your project.

Defining Multiple Loops

A *loop* is a group of connected function blocks that execute at a specified rate. You can define many loops in one Function Block Application Editor window.

Figure 4-15 shows an example of two separate loops running at the same rate.
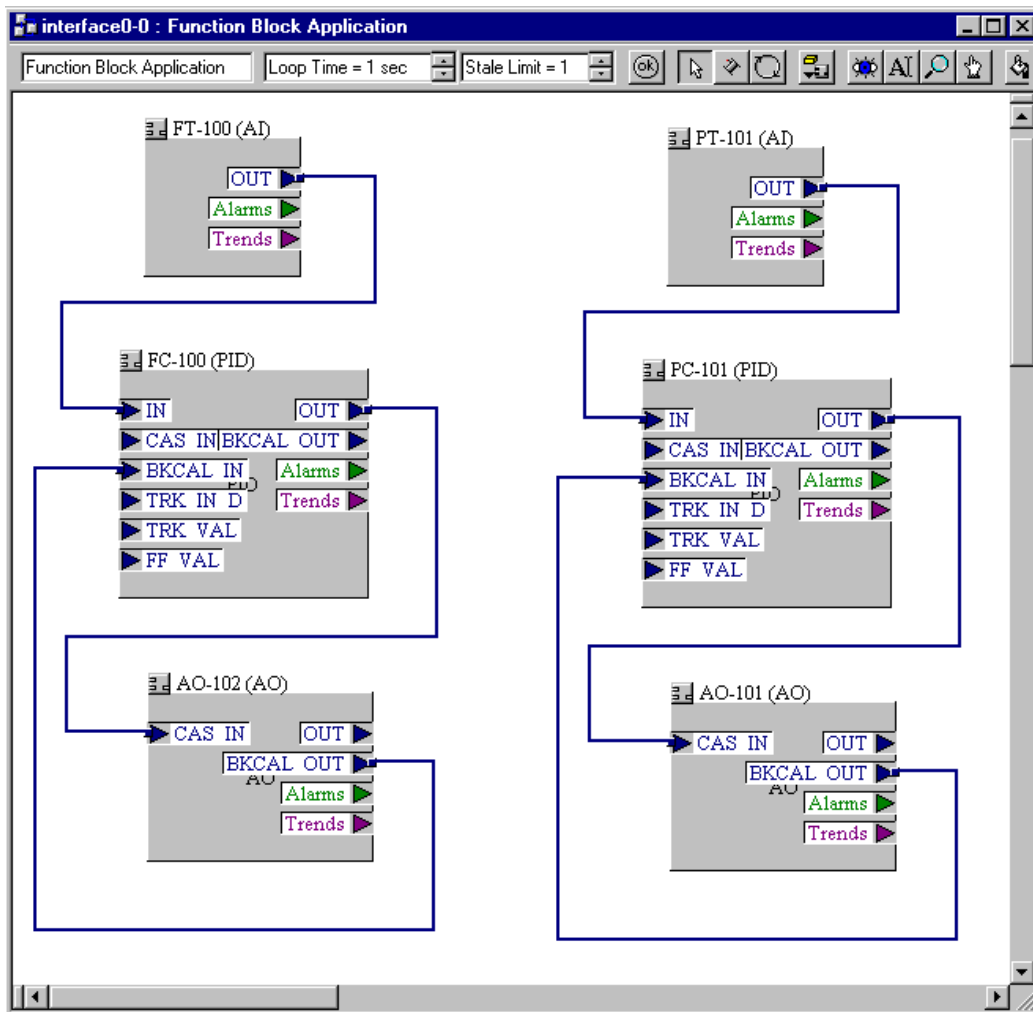
Figure 4-15. Multiple Loops

Defining Multiple Loops Running at Different Rates

The loop execution time shown on the Function Block Application Editor toolbar is the default execution time for all function blocks on the window *not* isolated in a loop structure. For example, the DI and DO blocks in Figure 4-16 execute at a rate of once every second and the AI-PID-AO loop executes once every 500 ms.
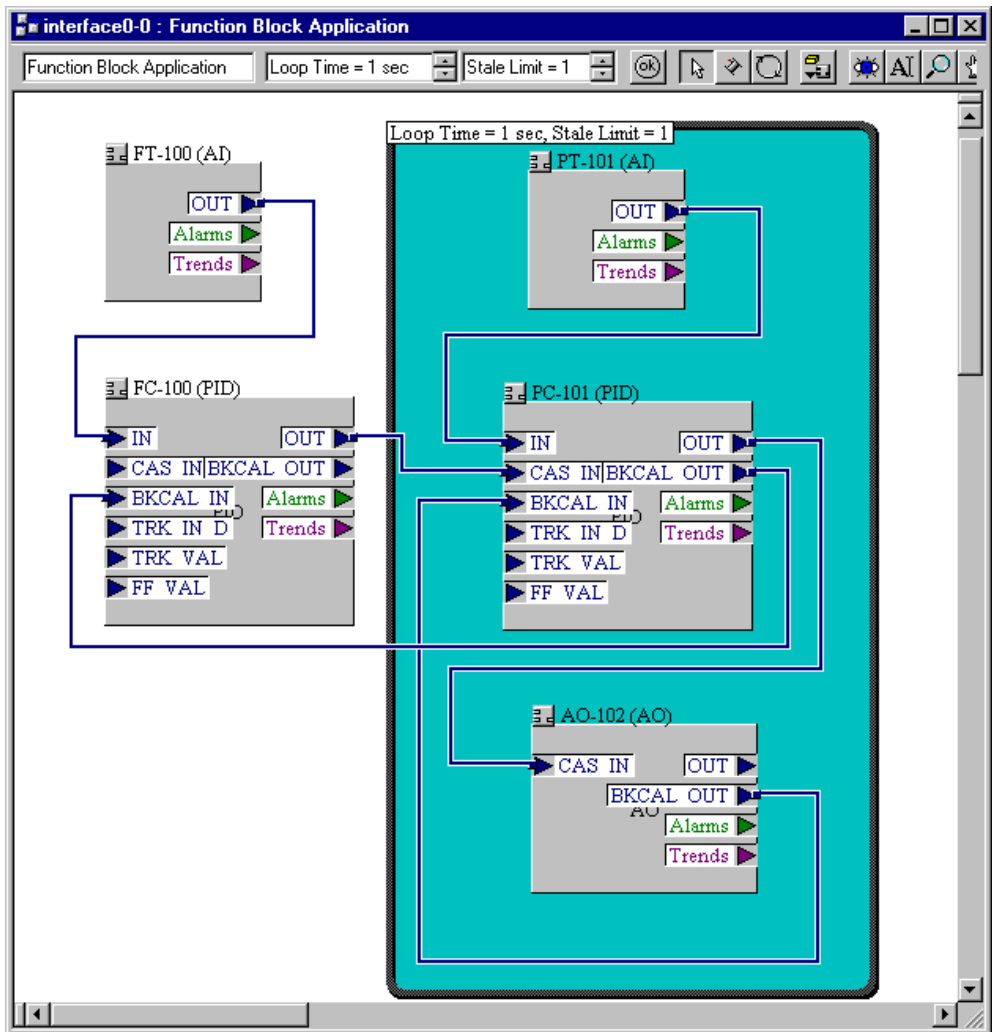
Figure 4-16. Two Loops Running at Different Rates

You can use the loop structure shown in Figure 4-17 to isolate a group of function blocks to run at a different execution rate than the rate on the Function Block Application Editor toolbar.
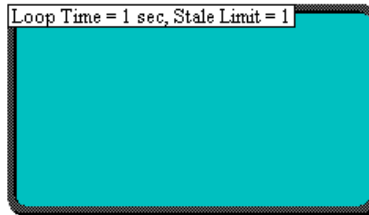
Figure 4-17. Loop Structure

To create a loop structure, complete the following steps:

1. Click on the **Loop** tool on the Function Block Application Editor toolbar.

2. Click on the background of the Function Block Application Editor and drag a loop around the blocks you want to put in the loop.

3. To change the loop execution time, type the new time in the box at the upper left of the loop.

Changing the Block Execution Order

To change the execution order of the blocks, complete the following steps:

1. In the Function Block Application Editor, click on the **Change Execution Order** button. Numbers appear on the blocks, indicating their current order, as shown in Figure 4-18.
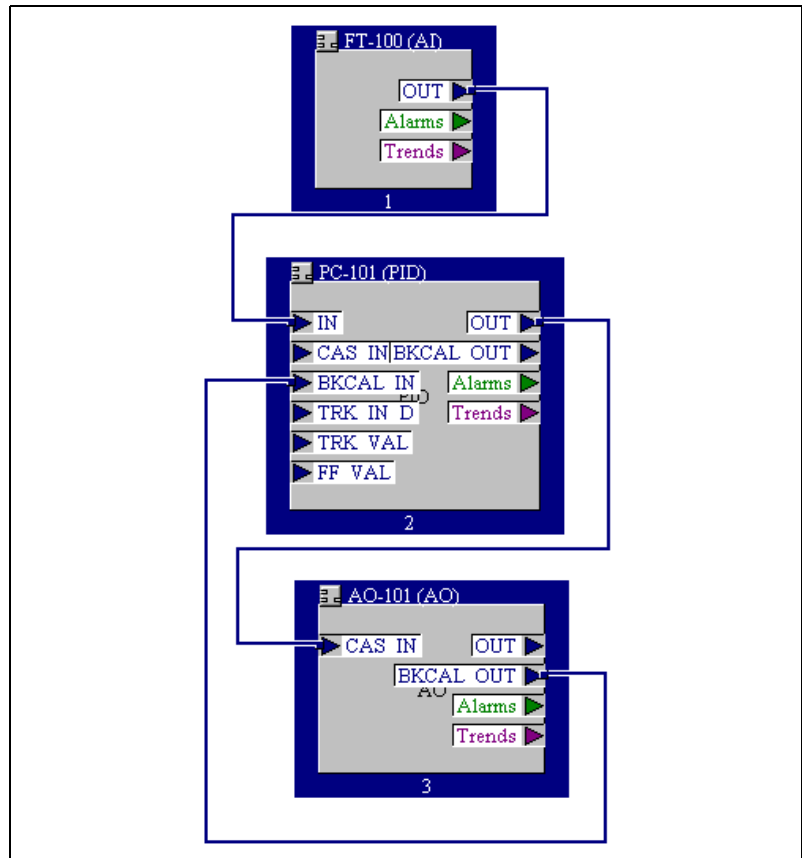
Figure 4-18. Changing the Order of Blocks

2. Click on the blocks in the order that you want them to execute.

3. When you are done, click on the background of the Function Block Application Editor window or select another tool.

Viewing and Editing Function Block Parameters

Each function block in your application has a Block window that you can use to change block parameters and other settings. When you read or write data on a block, the Status window shows the status of the transactions.

To open the Block window for a block, do one of the following:

- Double-click on the name of the function block in the Project window.

- Double-click on a function block in the Function Block Application Editor.

Figure 4-19 shows the Block window.
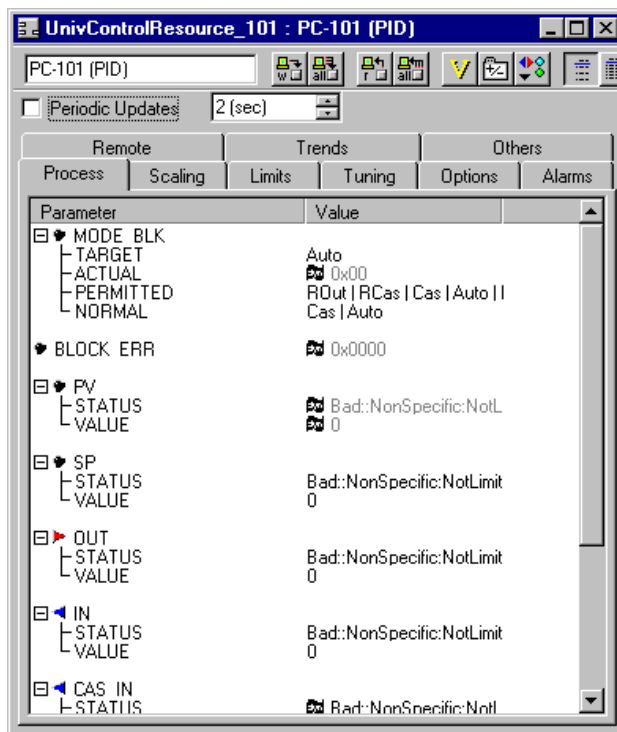
Figure 4-19. Block Window

Block Window Icons

As shown in Figure 4-19, an icon to the right of each parameter name color-codes and symbolically represents the class of the parameter. Table 4-1 describes the classes of the parameter.

Table 4-1. Block Window Icons

Shape	Color	Description
Circle	Alarms—Green	Represents contained parameters. Contained parameters cannot be linked to other parameters; they are contained in the block.
	Tuning—Light blue	
	Others—Black	
Right arrow	Red	Represents output
Left arrow	Blue	Represents input

Tabs of the Block Window

The Block window groups the parameters by functional category. For example, parameters related to alarms appear on the **Alarms** tab, and parameters related to tuning appear on the **Tuning** tab. Uncategorized parameters appear on the **Others** tab.

You can also customize the tabs of the Block window. You can add or delete tabs, change the order in which they appear in the window, and add or remove any block parameters.

☞ **Note:** *When you customize a tab of the Block window, that customization applies to all blocks of the same type. In other projects, blocks of the same type will have the same Block window tabs.*

Adding Tabs

To add a tab to the Block window, complete the following steps:

1. Click on the **Add or Delete Custom Tab** button in the Block window toolbar. The **Add & Delete Custom Tabs** dialog box appears, as shown in Figure 4-20.
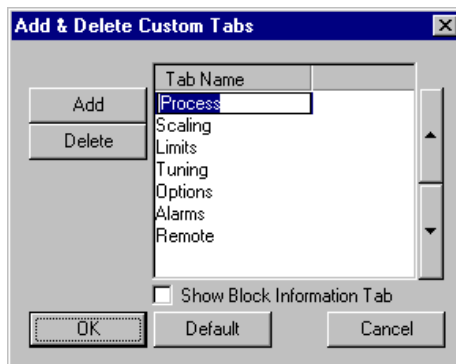
Figure 4-20. Add & Delete Custom Tabs Dialog Box

2. In the **Add & Delete Custom Tabs** dialog box, click on the section where you want to add the tab.

3. Click on the **Add** button and type the name of the new tab in the edit control that appears.

4. In the **Add & Delete Custom Tabs** dialog box, click on the **OK** button to generate the new tab.

   On the new tab in the Block window, right-click to display the popup menu and select **Customize Parameters**.

Removing Tabs

To remove a tab from the Block window, complete the following steps:

1. Click on the **Add or Delete Custom Tab** button in the Block window toolbar. The **Add & Delete Custom Tabs** dialog box appears, as shown in Figure 4-20.

2. In the **Add & Delete Custom Tabs** dialog box, click on the name of the tab that you want to remove.

3. Click on the **Delete** button.

Customizing Parameters

To customize the parameters on a Block window tab, right-click
on the tab in the Block window to display the popup menu and
select **Customize Parameters**.

Block Window Toolbar

The toolbar at the top of the Block window provides an interface for
reading and writing parameters. Figure 4-21 shows this toolbar.

Figure 4-21. Block Window Toolbar

Descriptions of the icons on this toolbar follow:

- **Device Tag**—This field shows the function block tag. To change
  the block tag, click on the field.

- **Write Changes**—Click on this button to write only changed
  parameters to the block on the device, including changed block
  tags.

- **Write All**—Click on this button to write all parameters, including
  changed block tags, to the block on the device.

- **Read Selected**—Click on this button to read a selected parameter.

- **Read All**—Click on this button to read all parameters.

- **Refresh**—Click on this button to update the screen.

- **Customize**—Click on this button to add, delete, or rename tabs for
  this type of block.

- **Spaced View**—Click on this button to add space between
  parameter listings.

- **Simple View**—Click on this button to display only the **Parameter**
  and **Value** columns.

- **Detailed View**—Click on this button to display the **Parameter**,
  Value, **Type & Range**, and **Help** columns.

Editing Block Parameters

The Block window displays the parameters in the order that they appear in the block. Parameters with a plus sign beside them are records or arrays (structures) that contain more than one entry. To expand the record or array, click on the plus sign, or to collapse the structure, click on the minus sign.

To edit a block parameter value, complete the following steps:

1. In the Function Block Application Editor, double-click on a function block to open the Block window, shown in Figure 4-22.
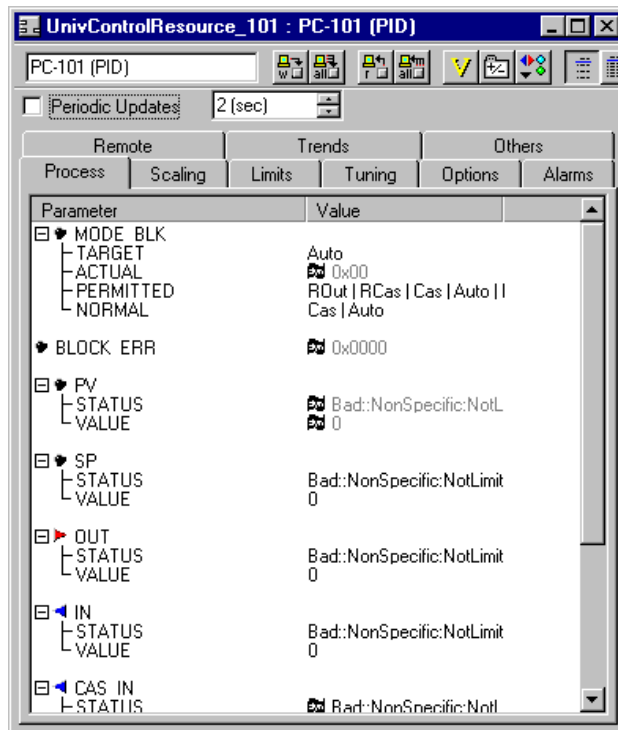
Figure 4-22. Block Window

2. To see the values of the record or array parameters in the Block window, click on the plus signs.

3. Use the cursor to select the parameter value you want to change and type in the new value. If a parameter value is grayed out, it is read-only and you cannot change it. After you change a parameter value, an asterisk (*) appears by the parameter name.

4. To make your changes effective immediately, click on the **Write changes** button on the Block window toolbar. If you do not click on the **Write changes** button, your changes take effect when you download the configuration.

Updating Block Parameters Values

You can update block parameter values manually or automatically, as described in the following sections.

Manually

To update each block parameter value manually, select the parameter and click on the **Read Selected** button in the Block window toolbar.

To update all the block parameter values, click on the **Read All** button.

Automatically

To update the block parameter values automatically, complete the following steps:

1. At the top of the Block window, check the **Periodic Updates** checkbox.

2. Select the poll rate from the drop-down list next to the **Periodic Updates** checkbox.

The NI-FBUS Configurator updates the block parameter values periodically, based on the poll rate you choose.

Using Menus and Methods

If you double-click on a function block in the Project windows and the block has menus and methods associated with it, a menu bar appears above the Block window toolbar and the **Methods** tab appears in the Block window.

To invoke a method, select it from the menu bar.

Configuring Alarms

You can configure a device, such as a PC, to receive alarms generated by function blocks. To configure alarms, complete the following steps:

1. Find the Project window icon for the device or interface to which you want to send the alarm. Drag this icon from the Project window to the Function Block Application Editor.

2. Wire the **Alarms** output of the block that you want to generate an alarm to the device you want to receive the alarm. Figure 4-23 shows an example of a configured alarm.
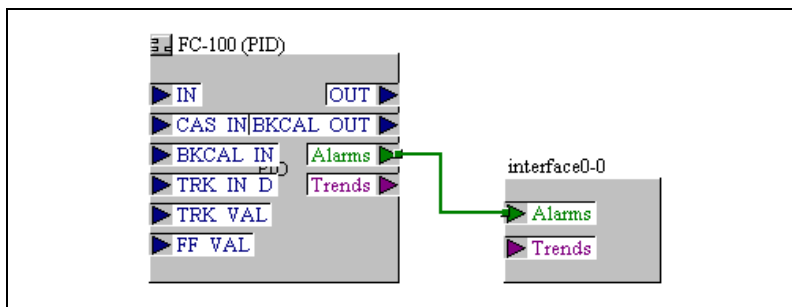
Figure 4-23. Configured Alarm

3. Double-click on the function block that you want to generate the alarm. The Block window appears.

4. In the Block window, click on the **Alarms** tab to view or change alarm information, such as the high and low limits of an alarm condition, alarm priorities, and so on.

Configuring Trends

You can configure a device, such as a PC, to receive trends from fieldbus devices. To configure trends, complete the following steps:

1. Find the Project window icon for the device or interface to which you want to send the trend. Drag this icon from the Project window to the Function Block Application Editor.

2. Double-click on the function block from which you want to send a trend. The Block window appears, as shown in Figure 4-24.
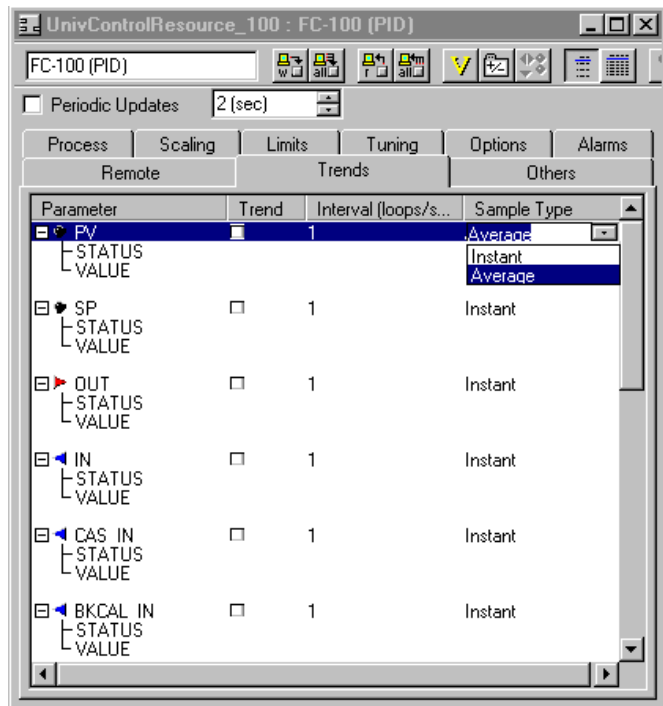
Figure 4-24. Trends Tab of the Block Window

3. In the Block window, click on the **Trends** tab.

4. Check the **Trend** column checkbox next to the parameter you want to trend.

5. Set the sample **Interval** of the trend in loops/sample.

6. Set the **Sample Type**. To do so, select **Instant** or **Average** from the **Sample Type** drop-down list. **Instant** trends the actual value. **Average** trends all samples.

7. Wire the **Trends** output of the block to the device you want to receive the trend. Figure 4-25 shows an example of a configured trend.
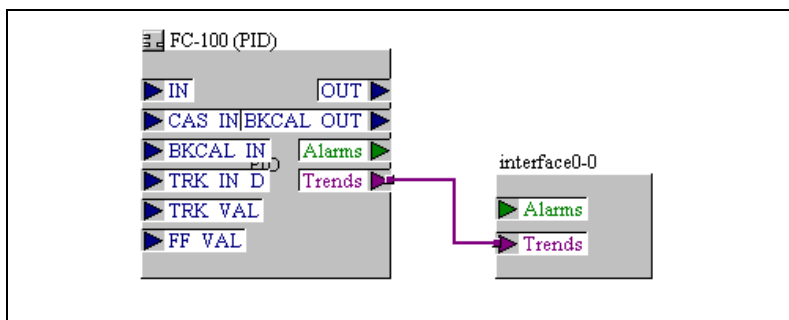
Figure 4-25. Configured Trend

Viewing and Editing a Schedule

The NI-FBUS Configurator automatically determines the execution order and timing of the schedule based on your control strategy, network and device factors, and on the loop execution rate you choose. The NI-FBUS Configurator also automatically optimizes the schedule. Double-click on the **Schedule** icon in the Project window to view or edit the link active schedule.

The NI-FBUS Configurator combines the link active schedule and function block schedules into one diagram, as shown in Figure 4-26.
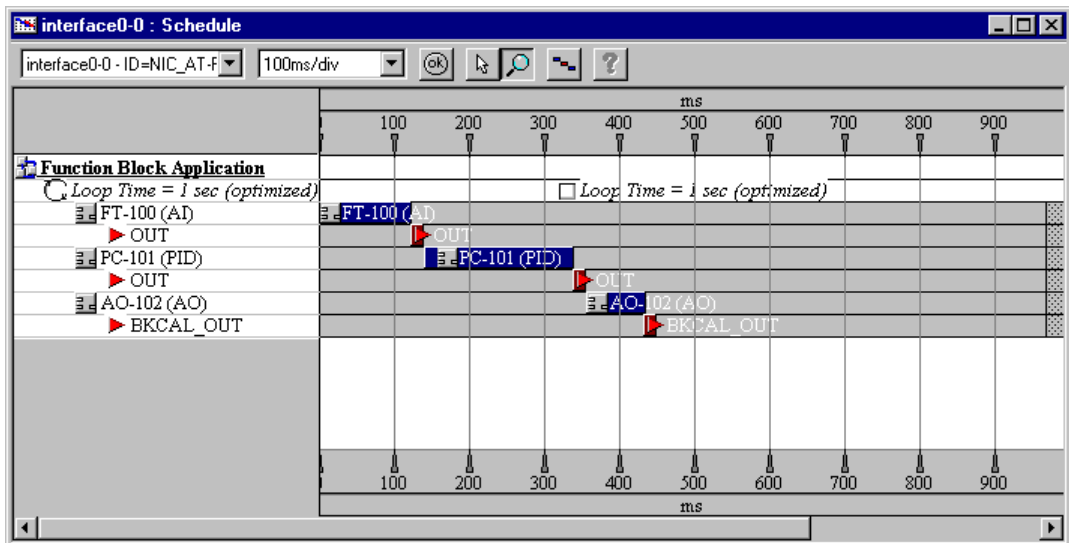
Figure 4-26. Schedule Window

In the Schedule window, a key of the scheduled objects appears on the left. The timing diagram on the right displays the execution times of the function blocks, and when data is transmitted on the bus.

The blue bars on the screen correspond to the function block execution times and the red bars correspond to the data transmission times, which consist of LAS notification time and transmission time.

☞ **Note:** *An optimized schedule can show that the transmission time overlaps the end time for the function block because the transmission time includes the time that the LAS uses to tell the device to send the data.*

To change the execution time for a loop, click on the execution time next to the loop icon and type in the new time.

Schedule Window Toolbar

Figure 4-27 shows the toolbar for the Schedule window.

| interface0-0 · ID=NIC_AT-F ▼ | 100ms/div ▼ | ⓞⓚ | ▷ | 🔍 | ◥ | ? |
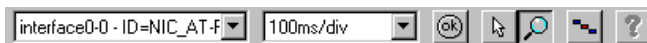
Figure 4-27. Schedule Toolbar

Descriptions of the icons on the Schedule window toolbar follow:

| interface0-0 · ID=NIC_AT-F ▼ |
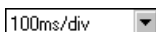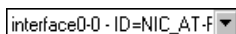
- **Primary LAS**—This field displays the name of the device that is the primary LAS for the system.

| 100ms/div ▼ |

- **Scale**—This field displays the time and divisions on the timing diagram.

- **Errors**—Click on this button to validate the schedule.

- **Pointer**—Use this tool to drag the time bars around on the timing diagram.

- **Zoom**—Click on this button to zoom in and out on the view.

- **Optimize Schedule**—Click on this button to rerun the optimization routine.

Changing the Link Active Schedule

You do not need to alter the schedule if the function block execution times in the device are correct. If the times in the device are incorrect, you might have to tune the execution times by dragging the execution time bars on the screen. Dragging bars around in the schedule shuts off the automatic optimization. If you want to reoptimize, click on the **Optimize Schedule** button on the Schedule window toolbar.

If the function block execution times in a device are incorrect, or if your control application needs a different schedule, you might want to change the schedule by completing the following steps:

1. Double-click on the **Schedule** icon in the Project window. The Schedule window appears.

2. Use the cursor to move the function blocks in the schedule as needed.

Multiple Loop Representation

Figure 4-28 shows how the NI-FBUS Configurator displays multiple loops in the Schedule window.
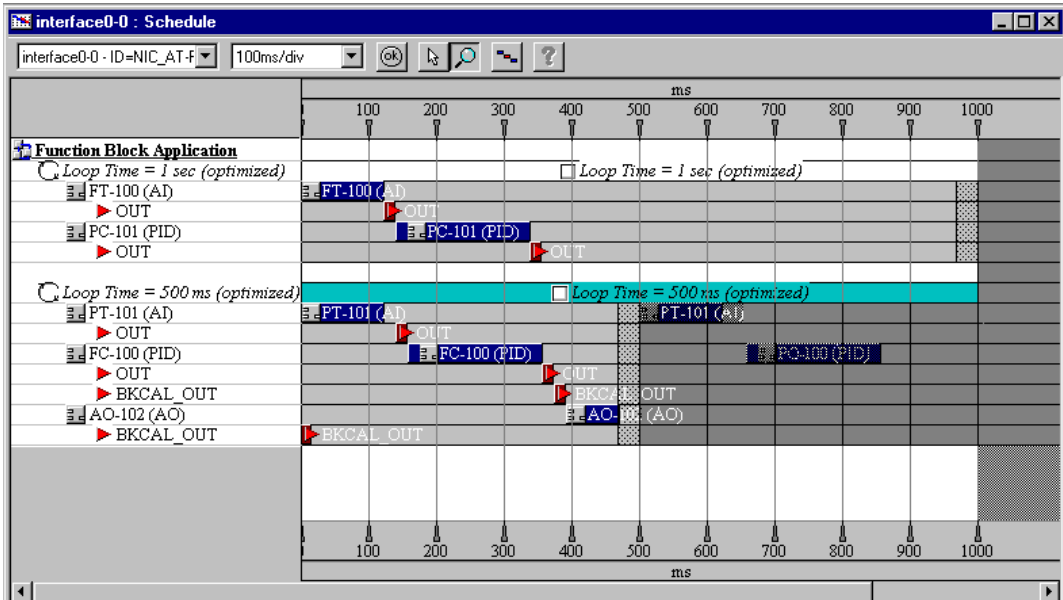
Figure 4-28. Multiple Loops in a Schedule

The loops are separated by white dividers. Click on the checkbox by the loop time shown above the colored bars to lock the loop and prevent you and the NI-FBUS Configurator from changing the schedule until you uncheck the box.

Setting Network Parameters

To change network parameters such as the Link Active Scheduler
(LAS) and primary time master, double-click on the **Network
Parameters** icon in the Project window, or click on the **Link Masters**
button in the **Download Configuration** dialog box.

The **Network Parameters** dialog box appears, as shown in Figure 4-29.
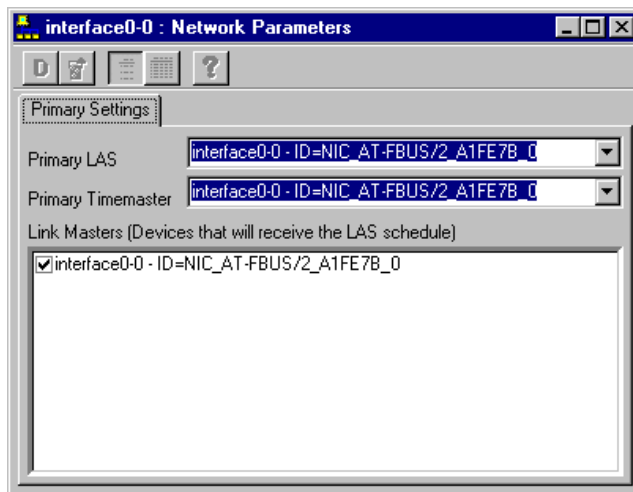
Figure 4-29. Network Parameters Window

This dialog box lists all devices capable of being link master for the
link. Every device you select in this dialog box receives the Link Active
Schedule when you download your configuration. Thus, if the primary
LAS is unavailable, one of these devices will execute the fieldbus
schedule.

Downloading a Configuration

When you download a configuration, the NI-FBUS Configurator configures the following items:

- Function block linkages between devices
- Function block schedule
- Alarms configuration
- Trends configuration
- Static parameters
- Communication schedule for the LAS

To download your configuration, complete the following steps:

1. Click on the **Download** button in the Project window toolbar or select **Configure»Download Configuration**. The **Download Configuration** dialog box, shown in Figure 4-30, appears.
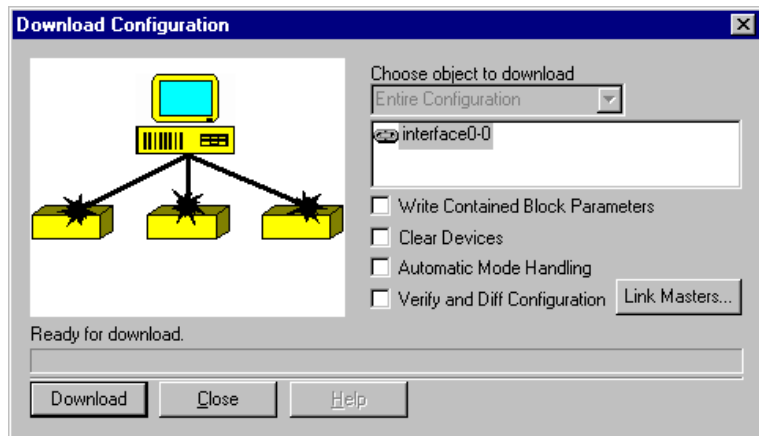
Figure 4-30. Download Configuration Dialog Box

2. Select the configuration object to download.
3. Click on the **Link Masters** button to set link masters to receive the Link Active Schedule, the primary Link Active Scheduler, and the primary time master of the link. The **Network Parameters** dialog box appears, as shown in Figure 4-29.
4. (Optional) To write all of the contained parameters of function blocks in the project, click on the **Write Contained Block Parameters** checkbox.

5. (Optional) If you want to make sure that the device does not have any communication configuration information that connects to devices outside the configuration you are downloading, you can reset or clear all of the communication connections from the devices on the bus. To do so, click on the **Clear Devices** checkbox.

6. (Optional) If you want the NI-FBUS Configurator to switch function blocks in the configuration to OOS mode and back to the desired mode automatically, check the **Automatic Mode Handling** checkbox.

   If you do not check this checkbox, you are responsible for changing the modes during the download process.

7. To download your fieldbus configuration changes to the network, click on the **Download** button. The **Download Status** progress bar shows what percentage of the configuration is complete.

   While downloading, the NI-FBUS Configurator displays and updates the **Download** tab in the status window. It shows what devices are configured, their settings, and whether it was successfully configured.

8. If you did not check the **Automatic Mode Handling** checkbox, click on the **Set All Targets to OOS** button to switch the function blocks to OOS mode. After the configuration downloads, you can set the blocks back to their normal mode of operation.

Monitoring a Function Block Application

You can configure how the NI-FBUS Configurator displays the graphical representation of the updates of I/O parameters and mode parameters of function blocks. To do so, complete the following steps:

1. On the Function Block Application Editor toolbar, click on the **Monitor** button. The **Monitor** dialog box appears, as shown in Figure 4-31.
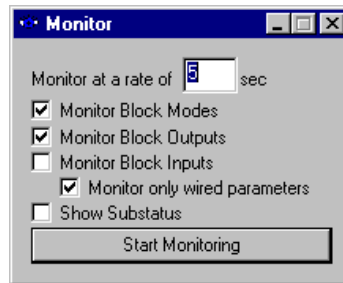
Figure 4-31. Monitor Dialog Box

2. In the **Monitor** dialog box, select the items you want the NI-FBUS Configurator to monitor and display.

3. After you download your configuration, click on the **Start Monitoring** button to monitor the application.

Verifying a Configuration

This section describes two ways to verify your configuration: a quick verification and a comparison of the configuration to a saved project. For instructions on how to verify a configuration, refer to the following sections, *Quick Verification* and *Comparing Two Configurations*.

Quick Verification

You can perform a quick check to verify that the parameters on the bus match those in the project. To verify the configuration of a link, device, or function block, complete the following steps:

1. Right-click on the object to display the popup menu and select **Verify Configuration**. The **Verification Test** dialog box appears, as shown in Figure 4-32.
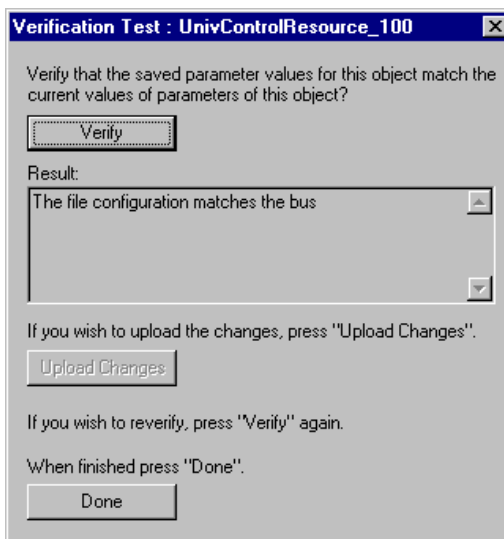
Figure 4-32. Verification Test Dialog Box

2. Click on the **Verify** button. The NI-FBUS Configurator compares the function blocks and project settings, and displays the results in the **Result** field.

3. If the function blocks do not match the project settings, you can click on the **Upload Changes** button to upload the function block parameters to the project.

4. Click on the **Done** button.

Comparing Two Configurations

You can upload your current bus configuration and compare it against a saved project. To do so, click on the **Verify and Diff** button in the Project window toolbar. You can also select **Configure»Verify and Diff Configuration**.

The NI-FBUS Configurator uploads device parameter values, function block schedules, trend and alarm connections, and function block application linkages, and compares them with the saved configuration. The NI-FBUS Configurator shows which components are different, as shown in Figure 4-33.
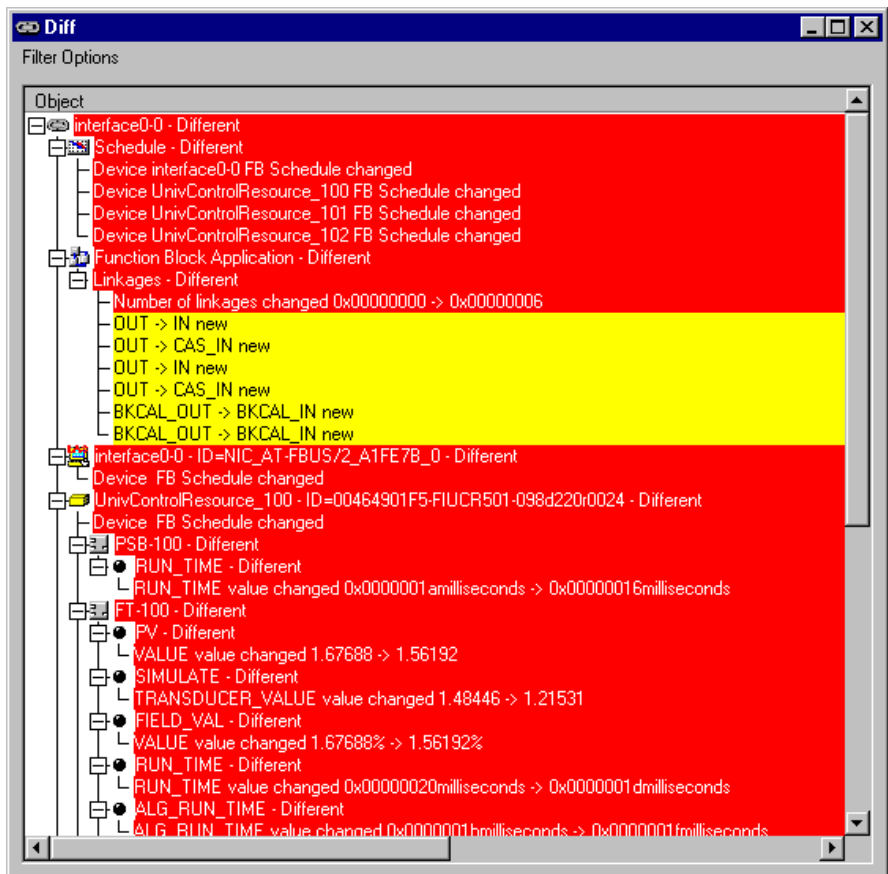
Figure 4-33. Diff Dialog Box

Viewing and Editing a Log

The Log/Notes window in the project keeps track of the last
downloaded configuration status output. The Log/Notes window shows
the same output as the **Download Log** tab of the **Status** window plus
the time and date of the last change and previous downloads of the
current project. To open the Log/Notes window, double-click on the
Log/Notes icon in the Project window. Figure 4-34 shows the
Log/Notes window.
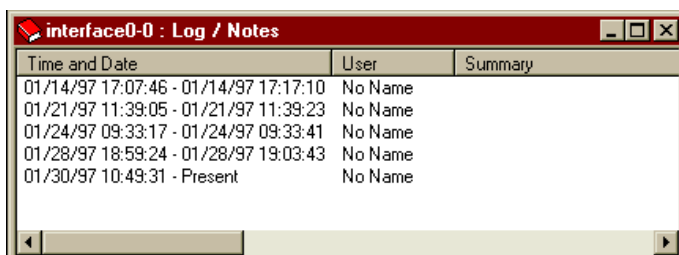
Figure 4-34. Log/Notes Window

Double-click on a log entry to see the download log for that session.
You can also add notes at the bottom of the download log for each
session, and the NI-FBUS Configurator automatically saves them with
the project for future reference.

Replacing Devices

Complete the following steps to substitute a new device for a missing device in the configuration:

1. From the **Configure** menu, select **Replace Devices** or right-click on a device and select **Replace Devices** from the popup menu that appears.

2. In the **Missing Device** field, select the device you want to replace from the drop-down list, as shown in Figure 4-35.
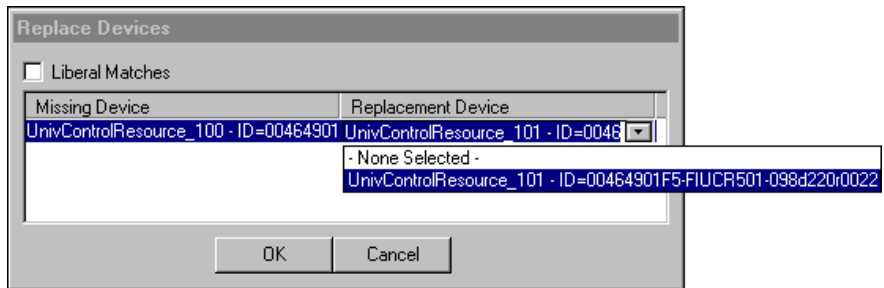
Figure 4-35. Replacing a Missing Device with the Correct Device

3. In the **Correct Device** field, select the new device from the drop-down list to replace the **Missing Device**.

4. After you select the desired devices, click on the **Done** button.

The NI-FBUS Configurator replaces the **Missing Device** with the **Correct Device**. When you download your changes, the new configuration, including linkages, tags, and parameter values, is written to the **Correct Device**.

Setting Preferences

To set your preferences in the NI-FBUS Configurator, select **View**»**Preferences**. The **Preferences** dialog box appears, containing three tabs: **Fonts**, **Parameter Views**, and **General**.

Descriptions of these three tabs follow:

*   **Fonts**—Use this tab to change the font types and sizes on the display. Figure 4-36 shows the **Fonts** tab.
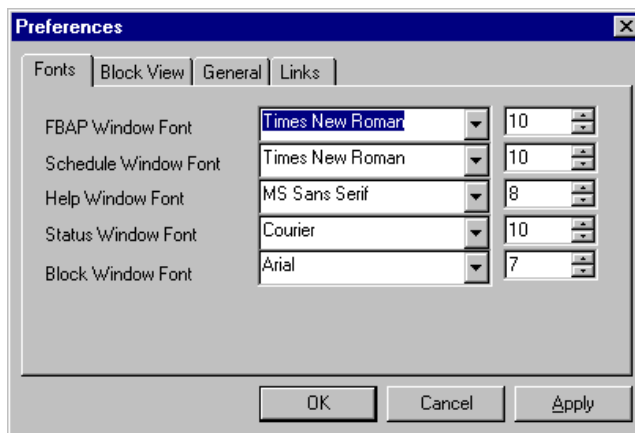
Figure 4-36. Preferences Dialog Box

*   **Parameter Views**—Use this tab to configure the default view for parameters:
    *   **Show Detailed View**—Click on this checkbox to show additional type and help strings for the view.
    *   **Show Spaced View**—Click on this checkbox to add space between parameters.
*   **General**—Use this tab to select which windows appear when you start the NI-FBUS Configurator.
*   **Links**—Use this tab to change the software key, as described in the following section, *Changing the Software Key*.

Changing the Software Key

The NI-FBUS Configurator software license has a default number of links that you can configure. If you purchase additional licenses to access more than the default number of links, contact National Instruments to obtain a new software key.

After you obtain a new key, complete the following steps to change the key:

1. Select **View**»**Preferences** and click on the **Links** tab, as shown in Figure 4-37.
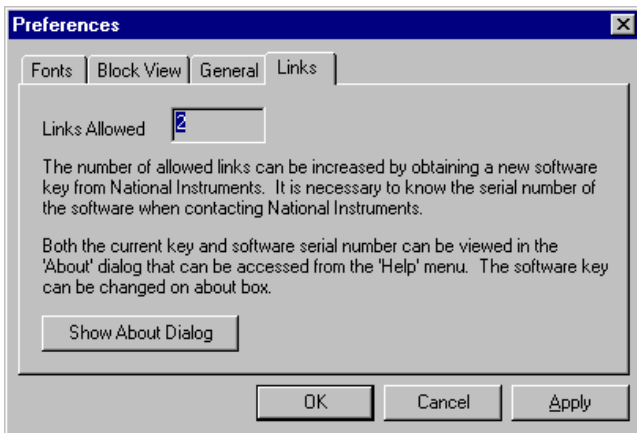
Figure 4-37. Links Tab of the Preferences Dialog Box

2. On the **Links** tab, click on the **Show About Dialog** button. The **About** dialog box appears.

3. Click on the **Set SW Key** button, enter the new key, and click on the **OK** button. Click on the **OK** button to close the **About** dialog box.

    The number of **Links Allowed** on the **Links** tab changes based on the new software key.

4. Click on the **OK** button to close the **Preferences** dialog box.

Printing

You can print your configured project in the form of text, graphical diagrams, and text explanations of the diagrams.

To print your project, select **File»Print**. From the **Print** dialog box, you can choose to print the **Entire Configuration** or only **Specific Configuration Items** in the Project window.

Figure 4-38 shows the **Print** dialog box.
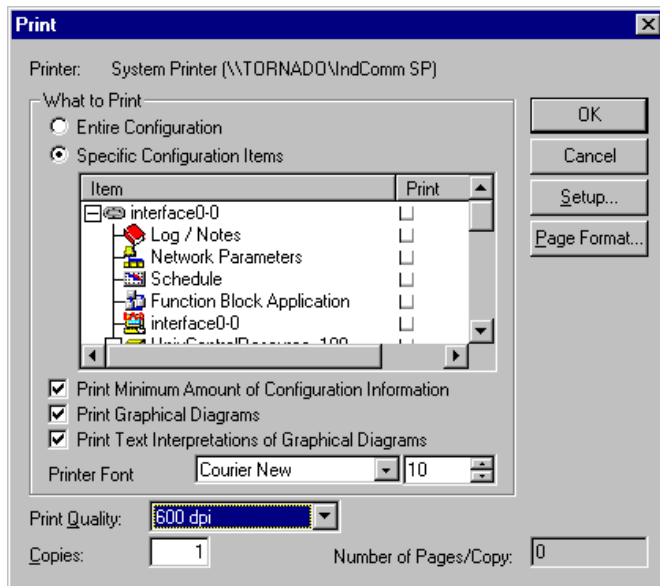
Figure 4-38. Print Dialog Box

Descriptions of the checkboxes and buttons in the **Print** dialog box follow:

- **Print Minimum Amount of Configuration Information**—Click on this checkbox to print only the minimum amount of information necessary to describe the printed items. If you check this item, the NI-FBUS Configurator prints only the function blocks that are used in a function block application of the project and does not print unused blocks.

- **Print Graphical Diagrams**—Click on this checkbox to print the function block application and graphical representation of the schedule.

- **Print Text Interpretations of Graphical Diagrams**—Click on this checkbox to print a text version of the function block application and schedule.
- **Page Format**—Click on this button to select printing styles for the graphical schematics, page titles, and numbering.

Error Messages and Warnings
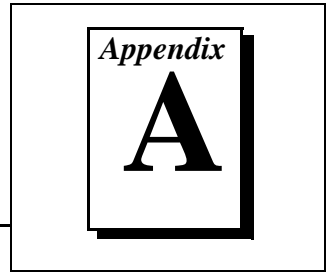
This appendix lists error messages you might receive while using the NI-FBUS Configurator and describes the error messages.

Error Messages

If you receive an error message while using the NI-FBUS Configurator, refer to this section for a description of the error and possible solutions.

NIF_ALARM_ACKNOWLEDGED

The alarm has already been acknowledged.

NIF_BAD_ARGUMENT

The value you gave is not of the correct data type.

NIF_BAD_DEVICE_DATA

The device returned inconsistent information.

NIF_BUF_TOO_SMALL

The buffer does not contain enough entries to hold all the information for the blocks. If you receive this error, buffer entries that you allocated did not contain valid block information when the call returned.

NIF_COMM_ERROR

An error occurred when NI-FBUS tried to communicate with the device.

NIF_CONFIG_ERROR

Some configuration information, such as Windows registry information or network configuration information, is incorrect.

NIF_DATA_NEVER_WRITABLE

The specified object is read-only.

NIF_DEVICE_NOT_PRESENT

The requested device is not operational.

NIF_EXCEED_LIMIT

The device reported that the value exceeds the allowable limit during a write operation.

NIF_INVALID_DESCRIPTOR

The descriptor you gave is invalid.

NIF_MULTIPLE

There are duplicate block tags.

NIF_NOT_FOUND

NI-FBUS could not find the specified object.

NIF_OBJECT_ACCESS_DENIED

The fieldbus interface does not have the required privileges. The access group you belong to is not allowed to acknowledge the event, or the password you entered is incorrect.

NIF_OBJECT_ACCESS_UNSUPPORTED

The device does not support write access to this object.

NIF_OBSOLETE_DESC

The input descriptor is no longer valid. It was closed before a function completed.

NIF_ORDINAL_NUM_OUT_OF_RANGE

The ordinal number is out of the device's range.

NIF_PARAMETER_CHECK

The device reported a violation of parameter-specific checks.

NIF_RESOURCES

NI-FBUS is unable to allocate some system resource; this is usually a memory problem.

NIF_SERVER_CONNECTION_LOST

The session established with NI-FBUS for this descriptor has been closed or lost.

NIF_SERVER_NOT_RESPONDING

Either the NI-FBUS server has not been started, or the server, in its current state, cannot respond to the request.

NIF_SM_NOT_OPERATIONAL

The device is present, but cannot respond because it is at a default address.

NIF_SYMBOL_FILE_NOT_FOUND

NI-FBUS could not find the symbol file.

NIF_TIMEOUT

The device containing the object is present but did not respond within the timeout period.

NIF_WRITE_IS_PROHIBITED

The device reported that the WRITE_LOCK parameter value is set. The WRITE_LOCK parameter prohibits writing to the name parameter.

NIF_WRONG_MODE_FOR_REQUEST

The device reported that the current function block mode does not allow you to write to the parameter.

NIFCONF_ERR_ADDRESS_OUT_OF_RANGE

This address does not fit in the allowable range of addresses.

NIFCONF_ERR_ADDRESS_USED

This address is already taken.

NIFCONF_ERR_BAD_WIRE

This wire is not completely attached to an output and input(s).

NIFCONF_ERR_BLOCK_SCHEDULE_CONFLICT

A block in this device is already scheduled for this time. Do not schedule more than one block in the device at the same time.

NIFCONF_ERR_BUF_TOO_SMALL

The buffer is too small.

NIFCONF_ERR_CONFIGURING

You are configuring this project. If you get this error, stop configuring the project to continue.

NIFCONF_ERR_CONFUSED_WIRE

This wire is not working. The NI-FBUS Configurator has removed it.

NIFCONF_ERR_CORRUPT_FILE

The NI-FBUS Configurator found a corrupt file object.

NIFCONF_ERR_COULD_NOT_DETERMINE_SCHEDULE

The NI-FBUS Configurator cannot fit the schedule of the loop into the current schedule. Usually, insufficient time or poor choice of loop times cause this error. Use integer multiples such as 1, 2, 4, and so on, instead of multiples like 5, 7, 13, and so on, to solve this problem.

NIFCONF_ERR_COULD_NOT_START_THREAD

The NI-FBUS Configurator is unable to start a new thread.

NIFCONF_ERR_DD_SIZE_MISMATCH

The actual data size does not match the DD data size.

NIFCONF_ERR_DEVICE_NOT_ALIVE

The device is not responding.

NIFCONF_ERR_DOWNLOAD_INCOMPLETE

The link is only partially configured.

NIFCONF_ERR_DUPLICATE_ADDRESS

The address for this device was found elsewhere in the configuration file. Duplicate addresses are not allowed on a fieldbus link.

NIFCONF_ERR_DUPLICATE_TAG

The tag for this object was found elsewhere in the configuration file. Duplicate tags are not allowed on a fieldbus link.

NIFCONF_ERR_INCOMPATIBLE_VERSION

This file was made with a newer version of the NI-FBUS Configurator. There might be unpredictable problems with the project.

NIFCONF_ERR_INVALID_MACROCYCLE

This macrocycle conflicts with a previously defined macrocycle.

NIFCONF_ERR_INVALID_NUMBER

This is an invalid number. A number can use the digits 0-9 and the letters a-f. Hexadecimal numbers can be preceded with `0x`.

NIFCONF_ERR_INVALID_TAG

This tag is not valid.

NIFCONF_ERR_INVALID_VALUE

You have entered an incorrect value. Please check the value(s) and the valid ranges for the values.

NIFCONF_ERR_LOOP_IS_EMPTY

This loop does not contain any blocks.

NIFCONF_ERR_MACROCYCLE_CONFLICT

This macrocycle conflicts with a previously defined macrocycle time for a device in this loop. Devices can only schedule one macrocycle time. The best solution is to increase the macrocycle time of the loop that contains the other block(s) for this device.

NIFCONF_ERR_MACROCYCLE_NOT_GOOD_MULTIPLE

This macrocycle is a bad choice in comparison to the other macrocycles.

NIFCONF_ERR_MACROCYCLE_TOO_SHORT

There was not enough time in this macrocycle to schedule all the function blocks and parameters. Increase the macrocycle time of the loop to get more free time.

NIFCONF_ERR_MAXIMUM_LOOPS_EXCEEDED

The maximum number of loops that you can configure on this link has been exceeded.

NIFCONF_ERR_MISSING_NIFBUS_PATH

The install path for NI-FBUS Configurator is not in the Windows registry.

NIFCONF_ERR_MULTI_LAS

Multiple primary Link Active Schedulers are defined. Only one primary LAS is allowed on a link.

NIFCONF_ERR_MULTI_TM

Multiple time masters are defined. Only one time master per link is allowed.

NIFCONF_ERR_NO_CONVERSION

There is no conversion for this data type.

NIFCONF_ERR_NO_DATA

No data.

NIFCONF_ERR_NO_LAS_SELECTED

A schedule has been created but no LAS is selected.

NIFCONF_ERR_NO_LM_SELECTED

A schedule has been created but no link master is selected.

NIFCONF_ERR_NO_OBJECT_SELECTED

Nothing is selected.

NIFCONF_ERR_NO_PRINTER_DEVICE_CONTEXT

The NI-FBUS Configurator cannot draw the document because of an incorrect device context for the selected printer.

NIFCONF_ERR_NO_TM_SELECTED

No time master is selected.

NIFCONF_ERR_NO_UNSCHEDULED_TIME_LEFT

The auto scheduler ran out of unscheduled time. Increase the macrocycle time(s) to allow more free time for scheduling.

NIFCONF_ERR_NOT_ON_LINK

This object does not belong on this link.

NIFCONF_ERR_OD_SIZE_MISMATCH

The size of the actual data object does not match the object dictionary (OD) size.

NIFCONF_ERR_OUT_OF_MEMORY

Memory is low; the NI-FBUS Configurator cannot allocate objects. Close windows to solve this problem.

NIFCONF_ERR_PARAMETER_SCHEDULE_CONFLICT

A parameter communication has already been scheduled for this time. Do not schedule more than one parameter communication at a time on the fieldbus.

NIFCONF_ERR_REGISTRY_ERROR

Some registry information for your application is missing or corrupt. You might need to reinstall the NI-FBUS software and the NI-FBUS Configurator. Refer to your getting started manual for installation instructions.

NIFCONF_ERR_STANDARD_DD_MISSING

The NI-FBUS Configurator could not find the standard DD file.

NIFCONF_ERR_STRING_NOT_FOUND

There is a missing resource string.

NIFCONF_ERR_TEMPLATE_NOT_ASSIGNED

The template is not assigned to a valid project object.

NIFCONF_ERR_TOO_MANY_FB_SCHEDULE_ENTRIES

The schedule for this object contains too many entries for the function block schedule of the device. Normally, bad choices for macrocycle times cause this error. Use macrocycle times that are integer multiples of each other to correct this problem.

NIFCONF_ERR_TOO_MANY_LAS_SCHEDULE_ENTRIES

The number of LAS schedule entries exceeds the number of available entries in the LAS device. Choose integer multiple macrocycle values and reduce the number of data links that go between devices to correct this problem.

NIFCONF_ERR_TYPE_INFO_UNAVAILABLE

The NI-FBUS Configurator cannot read the type information for the object.

NIFCONF_ERR_UNSCHEDULED_TRAFFIC_CONFLICT

The publish time is conflicting with the reserved 128 octet time at the end of a macrocycle. This time is used for unscheduled traffic.

NIFCONF_ERR_WRONG_TYPE

This object has the wrong type.

Warnings

If you receive a warning while using the NI-FBUS Configurator, refer to this section for a description of the warning and possible solutions.

NIFCONF_WARN_MEMORY_LOW

The system is low on memory.

NIFCONF_WARN_OBJECT_NOT_WIRED

This object is not connected by wires to any other object.

NIFCONF_WARN_NO_TREND_SELECTED

A trend is wired, but no trend is checked.

NIFCONF_WARN_TREND_NOT_WIRED

A trend is selected, but not wired to a device.

NIFCONF_WARN_PROJECT_ERRORS

There are errors that might cause problems in the download of the configuration. Look at the **Errors** tab in the Status window.

Troubleshooting and Common Questions

B

Appendix

This appendix describes how to troubleshoot problems and answers some common questions.

To determine how to solve a problem, refer to Table B-1.

Table B-1. Troubleshooting Problems

Problem	Possible Causes	Solution
A function block alternates between IMAN and AUTO modes. The status of the input parameter is **Bad::No comm**.	The function block and communication schedules do not have enough time between them.	Refer to the *Mode Transition* section later in this appendix.
The PID does not transition to AUTO mode.	The status of **OUT/BKCAL_OUT** from AI/AO is **Bad::Not Connected** or **Bad::No Comm**.	Refer to the *Mode Transition* section later in this appendix.
	The downstream block is not in cascade mode.	
The AI does not transition to AUTO mode from OOS mode.	The configuration is incorrect or incomplete.	Refer to the *Mode Transition* section later in this appendix.
The function blocks are in OOS mode.	The resource block is in OOS mode.	Set the target mode of the resource block to **AUTO**.
You receive a status of **Bad:Device Failure**.	An error exists with the hardware.	Set the **RESTART** parameter in the Block window to **Processor** or **Default**. If the problem persists, replace the device.

Table B-1. Troubleshooting Problems (Continued)

Problem	Possible Causes	Solution
A device does not appear in the Project window.	The communication parameters are incorrect.	Refer to the *Missing Devices* section later in this appendix.
You are unable to write to a block parameter.	The parameter is read-only.	If the parameter is not read-only, refer to the *Reading and Writing Errors* section later in this appendix.
	The blocks are in an incorrect mode.	
	The data is out of range.	
A device does not accept a permanent address.	The device does not have a tag.	You must set the device tag. For instructions on setting the tag, refer to the *Setting Device or Block Tags* section in Chapter 4, *Using the NI-FBUS Configurator*.
	If the device already has a tag, the T3 network parameter might not be the right length.	Remove the device from the active bus and configure its address separately.
A device does not accept a new tag.	The device is in an invalid state.	Power the device off and on.
The control is slow.	The macrocycle time might be too long.	Edit the function block schedule and decrease the macrocycle time. For more information about editing the schedule, refer to the *Viewing and Editing a Schedule* section in Chapter 4, *Using the NI-FBUS Configurator*

Table B-1. Troubleshooting Problems (Continued)

Problem	Possible Causes	Solution
A device does not transmit alarms or trends.	You have not configured the alarms or trends.	For instructions on how to configure alarms and trends, refer to the *Configuring Alarms* and *Configuring Trends* sections in Chapter 4, *Using the NI-FBUS Configurator*, respectively.
A device does not publish the data you configured it to transmit.	The function execution time parameter in the function block does not accurately represent the execution time.	Refer to the *Transmission Problems* section later in this appendix.
Your interface(s) does not appear in the **Add Links** dialog box.	You may need to upgrade your software key to support the additional links.	Refer to the *Missing Interface* section later in this appendix.
A function block is missing symbolic information (such as names and help strings).	The function block has no DD, and the block does not correspond to the standard function blocks defined by FOUNDATION Fieldbus.	You may need to import the DDs. To do so, refer to the *Missing Symbolic Information* section later in this appendix.
	The NI-FBUS Configurator cannot read pertinent block information from the device.	Reset the device.
You receive frequent communication errors when you try to read or write to a device.	Other devices are actively and frequently polling the device, causing reads to time out.	Reduce polling.
	The device is in an invalid state.	Reset the device.

Troubleshooting

This section describes how to troubleshoot problems you might encounter while using the NI-FBUS Configurator.

Missing Interface

If your interface(s) does not appear in the **Add Links** dialog box, you may need to upgrade your software key to support the additional links.

If you purchased additional licenses to access more than the default number of links, contact National Instruments to obtain a new software key.

After you obtain a new key, complete the following steps to change the key:

1. Select **View**»**Preferences** and click on the **Links** tab, as shown in Figure B-1.
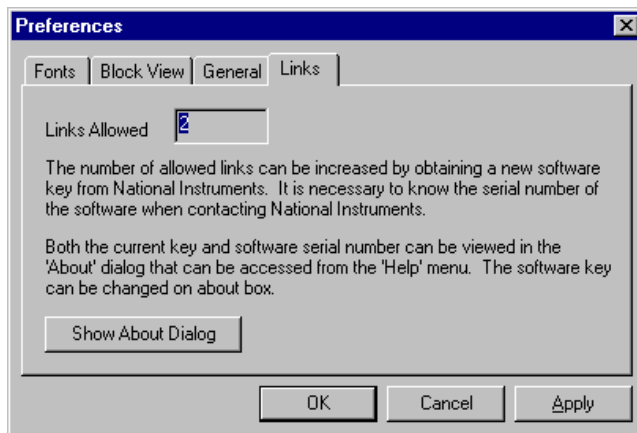

Figure B-1. Links Tab of the Preferences Dialog Box

2. On the **Links** tab, click on the **Show About Dialog** button. The **About** dialog box appears.

3. Click on the **Set SW Key** button, enter the new key, and click on the
    OK button. Click on the **OK** button to close the **About** dialog box.

    The number of **Links Allowed** on the **Links** tab changes based on
    the new software key.

4. Click on the **OK** button to close the **Preferences** dialog box.

Missing Symbolic Information

If a function block is missing symbolic information (such as names and
help strings), you may need to import the Device Descriptions (DDs).
For more information about DD files, refer to the *Device Description
Files* section in Chapter 1, *Fieldbus Overview*.

To import the DDs, complete the following steps:

1. Select **Start»Programs»NI-FBUS»Interface Config** to run the
    Interface Configuration utility.

2. Click on the **DD Info** button. The **DD Info** dialog box appears,
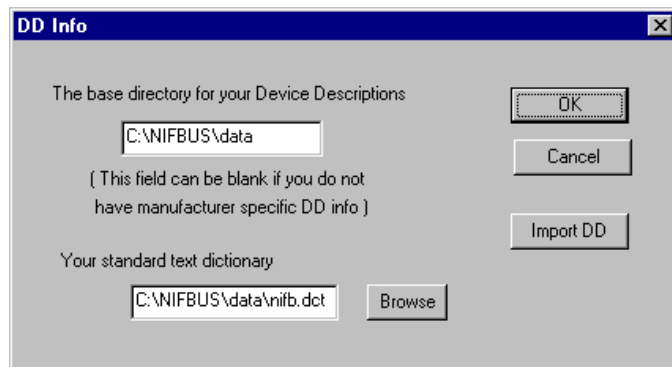   as shown in Figure B-2.

Figure B-2. DD Info Dialog Box

3. Type the base directory for your DD files in the first field.

4. If necessary, click on the **Browse** button to select your standard text
    dictionary.

5. Click on the **Import DD** button. The **Import DD** dialog box appears, as shown in Figure B-3.
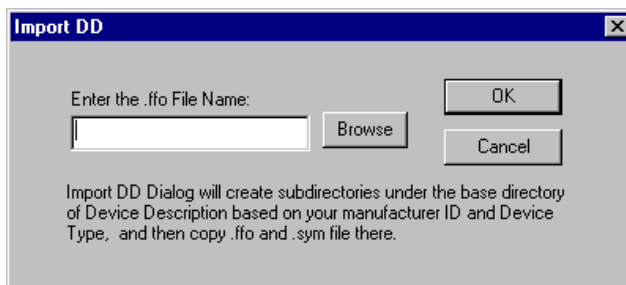

Figure B-3. Import DD Dialog Box

6. Click on the **Browse** button and browse to the `.ffo` DD file path and click on the **OK** button.
7. If the problem persists, reset the device.

Device Problems

If you receive a status of `Bad:Device Failure`, set the **RESTART** parameter in the Block window to **Processor** or **Default**. If the problem persists, replace the device.

If a device does not accept a permanent address, you must set the device tag. For instructions on setting the tag, refer to the *Setting Device or Block Tags* section in Chapter 4, *Using the NI-FBUS Configurator*. If the device already has a tag, the T3 network parameter might not be the right length. To solve this problem, remove the device from the active bus and configure its address separately.

If a device does not accept a new tag, it might be in an invalid state. To solve this problem, power the device off and on.

Missing Devices

If a device does not appear in the Project window, complete the following steps:

1. Check all connections.
2. Power on the bus.

3. Select **Start»Programs»NI-FBUS»Interface Config** and click on the **Advanced** button.

4. Set the following parameter values.

Parameter	Value
Number of unavailable nodes	0
InterPduDelay	20
Slot time	10
Max reply delay	8

5. Select **Start»Programs»NIFBUS»nifb** to restart the `nifb` process.

6. Select **Start»Programs»NIFBUS»NI-FBUS Configurator** to restart the NI-FBUS Configurator.

Transmission Problems

If a device does not transmit alarms or trends, you have not configured them yet. For instructions on how to configure alarms and trends, refer to the *Configuring Alarms* and *Configuring Trends* sections in Chapter 4, *Using the NI-FBUS Configurator*, respectively.

If a device does not publish the data you configured it to transmit, complete the following steps:

1. Edit the schedule to add more time to the communication schedule. To edit the schedule, double-click on the **Schedule** icon in the Project window.

    For more information about editing the schedule, refer to the *Viewing and Editing a Schedule* section in Chapter 4, *Using the NI-FBUS Configurator*.

2. If your project reads and polls information continuously, turn off polling to see if the device publishes the data. To turn off polling, uncheck the **Periodic Updates** checkbox at the top of the Block window.

Mode Transition

If a function block alternates between IMAN and AUTO modes, your function block and communication schedules do not have enough time between them. To solve this problem, complete the following steps:

1. Edit the schedule to add more time between the function block and communication schedules. To edit the schedule, double-click on the **Schedule** icon in the Project window.

    For more information about editing the schedule, refer to the *Viewing and Editing a Schedule* section in Chapter 4, *Using the NI-FBUS Configurator*.

2. After you edit the schedule, select **Configure»Download Configuration** to download the changes.

    For more information about downloading the configuration, refer to the *Downloading a Configuration* section in Chapter 4, *Using the NI-FBUS Configurator*.

If the PID does not transition to AUTO mode, complete the following steps:

1. Make sure that the AI and AO are publishing.

2. Make sure that the LAS executes the communication schedule. If not, select **Configure»Download Configuration** to download the configuration.

    For more information about downloading the configuration, refer to the *Downloading a Configuration* section in Chapter 4, *Using the NI-FBUS Configurator*.

3. Make sure the target mode of the downstream block is set to **CAS**.

If the AI does not transition to AUTO mode from OOS mode, complete the following steps:

1. Make sure the target mode is set to **AUTO**.

2. Make sure **EU_UNITS** is set to the value specified by the vendor.

If the function blocks are in OOS mode, set the target mode of the resource block to **AUTO**.

Reading and Writing Errors

If you are unable to write to a block parameter, the parameter might be read-only. However, if the parameter is not read-only, complete the following steps to solve the problem:

1. Change the target mode to **MAN** or **OOS** and then try to write to the parameter.

2. The data might be out of range. Check the range and make sure the value is valid.

If you receive frequent communication errors when you try to read or write to a device, reduce polling. If the problem persists, reset the device.

Common Questions

How can I speed up the control?

If the control is slow, the macrocycle time might be too long. To speed up the control, edit the function block schedule and decrease the macrocycle time.

For more information about editing the schedule, refer to the *Viewing and Editing a Schedule* section in Chapter 4, *Using the NI-FBUS Configurator*.

Why is my interface missing from the Add Links dialog box?

If your interface(s) does not appear in the **Add Links** dialog box, you may need to upgrade your software key to support the additional links.

If you purchased additional licenses to access more than the default number of links, contact National Instruments to obtain a new software key.

After you obtain a new key, complete the following steps to change the key:

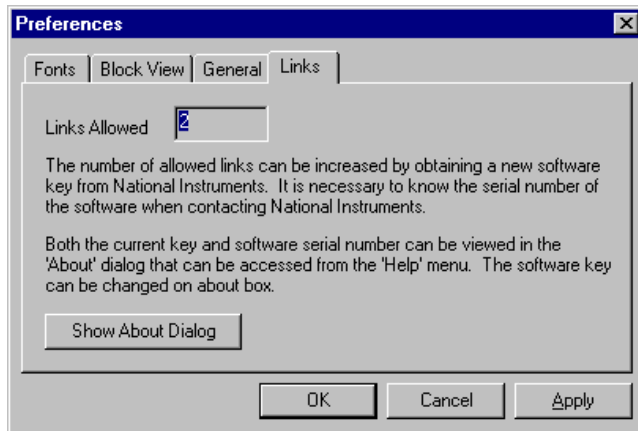1. Select **View**»**Preferences** and click on the **Links** tab, as shown in Figure B-4.

Figure B-4. Links Tab of the Preferences Dialog Box

2. On the **Links** tab, click on the **Show About Dialog** button. The **About** dialog box appears.

3. Click on the **Set SW Key** button, enter the new key, and click on the **OK** button. Click on the **OK** button to close the **About** dialog box.

   The number of **Links Allowed** on the **Links** tab changes based on the new software key.

4. Click on the **OK** button to close the **Preferences** dialog box.

Customer Communication
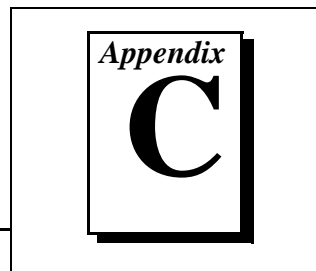
For your convenience, this appendix contains forms to help you gather the information necessary to help us solve your technical problems and a form you can use to comment on the product documentation. When you contact us, we need the information on the Technical Support Form and the configuration form, if your manual contains one, about your system configuration to answer your questions as quickly as possible.

National Instruments has technical assistance through electronic, fax, and telephone systems to quickly provide the information you need. Our electronic services include a bulletin board service, an FTP site, a fax-on-demand system, and e-mail support. If you have a hardware or software problem, first try the electronic support systems. If the information available on these systems does not answer your questions, we offer fax and telephone support through our technical support centers, which are staffed by applications engineers.

Electronic Services

Bulletin Board Support

National Instruments has BBS and FTP sites dedicated for 24-hour support with a collection of files and documents to answer most common customer questions. From these sites, you can also download the latest instrument drivers, updates, and example programs. For recorded instructions on how to use the bulletin board and FTP services and for BBS automated information, call 512 795 6990. You can access these services at:

United States: 512 794 5422
Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

United Kingdom: 01635 551422
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

France: 01 48 65 15 59
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

FTP Support

To access our FTP site, log on to our Internet host, `ftp.natinst.com`, as `anonymous` and use your Internet address, such as `joesmith@anywhere.com`, as your password. The support files and documents are located in the `/support` directories.

Fax-on-Demand Support

Fax-on-Demand is a 24-hour information retrieval system containing a library of documents on a wide range of technical information. You can access Fax-on-Demand from a touch-tone telephone at 512 418 1111.

E-Mail Support (Currently USA Only)

You can submit technical support questions to the applications engineering team through e-mail at the Internet address listed below. Remember to include your name, address, and phone number so we can contact you with solutions and suggestions.

`support@natinst.com`

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National Instruments has branch offices all over the world. Use the list below to find the technical support number for your country. If there is no National Instruments office in your country, contact the source from which you purchased your software to obtain support.

Country	Telephone	Fax
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Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Brazil	011 288 3336	011 288 8528
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Québec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 725 725 11	09 725 725 55
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 6120092	03 6120095
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
United Kingdom	01635 523545	01635 523154
United States	512 795 8248	512 794 5678

Technical Support Form

Photocopy this form and update it each time you make changes to your software or hardware, and use the completed copy of this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

If you are using any National Instruments hardware or software products related to this problem, include the configuration forms from their user manuals. Include additional pages if necessary.

Name _____

Company _____

Address _____

_____

Fax (___)_____ Phone (___) _____

Computer brand _____ Model _____ Processor_____

Operating system (include version number) _____

Clock speed _____MHz RAM _____MB   Display adapter _____

Mouse ___yes   ___no   Other adapters installed _____

Hard disk capacity _____MB   Brand _____

Instruments used _____

_____

National Instruments hardware product model _____   Revision _____

Configuration _____

National Instruments software product _____Version _____

Configuration _____

The problem is: _____

_____

_____

_____

_____

List any error messages: _____

_____

_____

The following steps reproduce the problem:_____

_____

_____

_____

_____

_____

Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Complete a new copy of this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

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Hardware Type and Revision _____

Interrupt Level of Hardware _____

Base I/O Address of Hardware _____

Software Version _____

Other Products

Computer Make and Model _____

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Clock Frequency _____

Type of Video Board Installed _____

Operating System _____

Operating System Version _____

Operating System Mode _____

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Programming Language Version _____

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Base I/O Address of Other Boards _____

DMA Channels of Other Boards _____

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Prefix	Meaning	Value
m-	milli-	10^{-3}

A

AI   Analog Input

AO   Analog Output

B

basic device   a device that can communicate on the fieldbus, but cannot become the LAS

BG   Bias Gain

block   A logical software unit that makes up one named copy of a block and the associated parameters its block type specifies. The values of the parameters persist from one invocation of the block to the next. It can be a resource block, transducer block, or function block residing within a VFD.

block tag   a character string name that uniquely identifies a block on a fieldbus network

bridge   an interface in a fieldbus network between two different protocols

C

contained parameter   a parameter that does not receive or send data, and is contained within a function block

control loop   a set of connections between blocks used to perform a control algorithm

control strategy   *see* function block application

CS   Control Selector

D

DCS   Distributed Control System

DD   Device Description

deterministic   communication in which data is transferred between a given set of devices
communication   at the same time during each loop

device ID   An identifier for a device that the manufacturer assigns. Device IDs must
                            be unique to the device; no two devices can have the same device ID.

device tag   a name you assign to a fieldbus device

DI   Discrete Input

DO   Discrete Output

F

FBAP   *see* function block application

fieldbus   an all-digital, two-way communication system that connects control
                            systems to instrumentation

Fieldbus Foundation   the organization that developed a fieldbus network specifically based upon
                            the work and principles of the ISA/IEC standards committees

FOUNDATION Fieldbus   the communications network specification that the Fieldbus Foundation
                            created

function block   A named block consisting of one or more input, output, and contained
                            parameters. The block performs some control function as its algorithm.
                            Function blocks are the core components you control a system with. The
                            Fieldbus Foundation defines standard sets of function blocks. There are ten
                            function blocks for the most basic control and I/O functions.

function block application	a fieldbus application that you create using FOUNDATION Fieldbus function blocks

I

IEC	International Electrotechnical Commission. A technical standards committee which is at the same level as the ISO.
input parameter	a block parameter that receives data from another block
ISA	International Society for Measurement and Control

L

LAS	*see* Link Active Scheduler
link	a group of fieldbus devices connected across a single wire pair with no intervening bridges
Link Active Schedule	a schedule of times in the macrocycle when devices must publish their output values on the fieldbus
Link Active Scheduler	A device that is responsible for keeping a link operational. The LAS executes the link schedule, circulates tokens, distributes time and probes for new devices.
Link master device	a device that is capable of becoming the LAS
linkage	a connection between function blocks
loop	*see* control loop

M

macrocycle	the least common multiple of all the loop times on a given link
ML	Manual Loader

O

OD   object dictionary

OOS   out of service

output parameter   a block parameter that sends data to another block

P

PD   Proportional Derivative

PID   Proportional Integral Derivative

R

RC   Ratio Control

S

s   seconds

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